September 1949

Agriculture

The Journal of the Ministry of Agriculture

VOL. LVI No. 6

PUBLISHED 6d MONTHLY

HIS MAJESTY'S STATIONERY OFFICE

AGRICULTURE

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

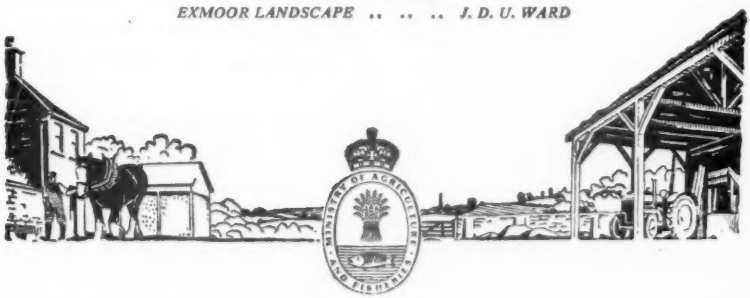
Editorial Offices: St. Andrew's Place, Regent's Park, N.W.1 *(Phone : WELbeck 7711)*

VOL. LVI No. 6 SEPTEMBER 1949

Contents

Cover Photograph

EXMOOR LANDSCAPE .. .. .. J. D. U. WARD



AGRICULTURE

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

VOL. LVI No. 6 SEPTEMBER 1949

SOME ECONOMIC ASPECTS OF BULLOCK-FEEDING

W. HARWOOD LONG, M.A.

Department of Agriculture, University of Leeds

ROAST beef has for long been regarded almost as a national emblem, and in spite of the pre-war invasion of Argentine chilled beef and the impeccable reputation of Scotch longsides, there has always been something typically English about beef, whether grazing on the pastures in the summer, feeding in foldyards in the winter, or awaiting the grace at table. But nowadays there are many fewer bullocks at grass than there used to be, the numbers fattened in the winter have decreased tragically, and no board is likely to groan under the present-day ration of meat.

Much has been heard of the meat shortage from the consumer's point of view, and in its attempts to overcome the present critical shortage the Government has just offered a substantial increase in price to the Argentine for imported beef. Quite recently, too, it raised the price of home-fed fat cattle by 4s. 6d. per cwt. live weight (following a much larger increase in 1947), and it also pays a subsidy of £4 a head for steer calves and £3 a head for heifer calves suitable for rearing. The purpose of this article is to discuss some of the features of beef production from the home producer's point of view.

Feeding cattle can be divided into two classes—grass fattened and yard fattened. This division is useful, although, as will be shown later, the two methods of feeding sometimes merge.

It is fairly easy to write about grazing cattle, though considerable skill is necessary to practise it successfully. Costs depend largely on the rent of pasture, and where no artificial food is fed they can vary from £2 to £4 10s. per beast for a grazing period of 20 weeks or so. Success depends on the management of the grass and on the margin between the cost of the store when it is bought and the price of the fat beast. In the old days the grazier was able to demonstrate his skill at both ends, but nowadays if he does not buy his stores well his chances of a profit rest entirely on the success with which he manages his pastures and the beasts that graze them. Frequently the price per cwt. of stores in the spring is greater than the price of beef when the beast is sold fat. This jeopardizes the prospect of a profit, but it does not destroy it altogether, and usually grazing cattle should not lose money if the store price is not more than 6s. or 8s. per cwt. above the fat price. A study of grass feeding in Wales for three years during the war showed fat prices a shilling or so per cwt. higher than the prices the animals were bought at, and a profit of between £4 and £5 per head(1). More recently the Nottingham School of Agriculture has published a report on the results of grass feeding in 1946 and 1947. The fat price was some 3s. or 4s. per cwt.

above the store price, and profits of roughly £3–£4 per head were made in the two years(2). In both these studies, however, nothing was allowed for overheads, and the real profit would, therefore, have been rather less than these figures. The present prices of store cattle make it difficult to believe that there will be any profit on grazing steers or maiden heifers bought this spring.

The problem with winter-fed beasts is less straightforward because seldom, particularly since 1939, have store cattle been fed in yards to make a direct profit. Financial returns computed by some universities and agricultural colleges are not encouraging. Most recent studies reveal direct losses of not less than £2 per beast, except in the years when an increase in the schedule of prices occurred during the feeding period.

The only economic justification for a branch of farming which shows continuous direct losses is any indirect advantage that may be associated with it—this with winter-fed cattle is the treading of the straw into farmyard manure. Often, too, the labour required by yarded cattle has no satisfactory alternative employment.

Experiments at Saxmundham on the value of the increased crops grown by using farmyard manure suggest that at 1943-44 prices the value of dung was 45s. per ton(3). The quantity of dung made should be not less than one ton per beast per month, and on a five-month feeding period the value of the dung should usually, therefore, be enough at least to offset the cash loss on feeding.

Many feeders have, however, expressed their dissatisfaction with the direct losses they have recently sustained for their fat beasts, and they are seeking a way to convert their losses into profits.

The pre-war method of winter feeding was to buy store bullocks in the autumn and feed them for four or five months, largely on home-grown foods. The cattle were in the yards in the dead months of the year, when the considerable demand that they make on the labour staff could be met. By March the yards were empty, or almost empty, and the field work was not interfered with.

During and since the war less concentrates and more hay and straw have been fed than was usual when foods were more plentiful ; the cattle have been done rather more slowly and the proportion which are out of the yards by the end of March is not nowadays so great as before the war.

Until this year the price of fat cattle did not begin to fall before the middle of June, and many feeders were able to vary the traditional method by running their cattle in good store condition through the winter and finishing them on the grass.

A report from King's College, Newcastle(4), gives some revealing figures on this change in method. On 904 beasts that were wintered in 1946-47 and subsequently fattened on the grass, the net profit was £8 6s. per beast. This seems a very large profit when one remembers the losses which are the results of the alternative method. It is, in fact, too good to be generally true because it includes some beasts that were sold after August 25, 1947, when prices were increased by 14s. 4d. per cwt. or £8 12s. on a 12-cwt. beast. But if this is allowed for and the profit calculated on the basis of the price schedule before it was revised, the margin becomes 70s. per beast. Of course, the dung made during the winter in this way is not of the same quality as the cake-fed dung used to be, but it is possible to make up the difference by applying more artificial fertilizers.

Influence of Rearing Costs The actual fattening process takes up only some six months or so of the beast's life, whereas it is usually two or two and a half years old before fattening is begun. In point of time occupied, therefore, the rearing period is more

important than the fattening period, and the costs of rearing deserve at least as much discussion as the costs of fattening. These costs are complicated by the fact that there are many reasons besides direct profit that may decide a man to rear and/or fatten cattle, and often the method of management has to fit in with the requirements of the farm, instead of the system being moulded into the most profitable form. Here are nine reasons that may persuade a man to rear or fatten cattle :

1. For profit.
2. For manure.
3. To graze leys.
4. To improve hill land for sheep grazing.
5. To dispose of the culls from a dairy herd.
6. To utilize the by-products of arable land.
7. To utilize land that would otherwise be wasted.
8. For pleasure.
9. To satisfy the A.E.C.

Sometimes more than one of these apply at a time. Thus a Yorkshire Wolds farmer keeps a herd of beef cows which he crosses with a Hereford bull to utilize 80 acres of a dale that is too steep to plough. In the winter the cows and their progeny consume his arable by-products and make his straw into manure, while he has the pleasure of being able to look at a particularly pretty bunch of young stock when he walks down into his fold-yard in the winter or strolls round his farm on a summer evening. These beasts thus fulfil at least four functions.

Another Yorkshire farmer rears calves in order to save the high cost of Irish stores. They graze the leys he is introducing into his system as a means of lengthening the rotation to combat potato root eelworm.

Some farmers are still willing to lose money winter feeding cattle because of the manure and the satisfaction that a yard of well-bred bullocks will give. But they probably would not do it for one of these reasons alone.

Since cattle are kept for so many purposes, it is not difficult to understand that there are several methods of rearing. The chief are single suckling, multiple suckling, and bucket rearing.

Under single suckling the cows calve in the spring and during the seven months or so before weaning they live almost entirely on grass and consequently rear their offspring with the minimum expenditure on food and labour. By winter they are dry and are doing nothing beyond carrying next year's calves, and they can therefore still live cheaply ; many spend the winter outside, and on those farms where the cows are wintered in yards in arable districts the reason is generally to tread straw into manure. Single suckling is therefore an easy method of rearing calves, and cheap in every way except that the full year's cost of the cow has to be charged against one calf.

Under multiple suckling one cow should rear three or four calves and may be capable of rearing ten or a dozen in small batches. This system and bucket rearing require much more labour than single suckling ; moreover a good deal of skill is needed if the calves are to be kept in thriving condition. With winter milk at its present price there is a big temptation to sell it rather than feed it to calves, and it is easier to spare summer milk for calf rearing. On the other hand, arable farmers can usually spare labour for stock rearing more readily in winter than in summer.

It is difficult to generalize about rearing costs because they vary with the different methods adopted and from farm to farm. Where single suckling is undertaken on herds wintered outside entirely, the cost consists of grazing and whatever hand meat may be fed in the winter. Some farmers give nothing but hay (some nothing but straw) throughout the winter, and the

cost of the calf up to weaning at, say, seven months old appears to be as low as £7 10s. (plus overheads) in reasonably favourable conditions. If the cows are brought into yards for part of the winter, costs rise considerably. Where they are used to turn straw into dung it is, however, easy to overestimate the real cost of yarding the cows on an arable farm, for they may be the cheapest means of maintaining the fertility of the farm.

Data on calf-rearing costs at the present time are few and far between, and it is unwise to be dogmatic.

Probably most calves have cost at least £2 a month to rear by the time they are weaned. Their subsequent costs will then depend largely on whether they are weaned in spring or in autumn. The cost of summering a store beast is generally low, and will involve little more than the cost of pasture. In winter, costs are much higher for as long as the cattle are indoors, and will probably exceed £1 a month. Thus a beast at a year old may have cost £16 if born in the autumn and £20 or more if born in the spring. From then onwards until feeding is begun they should increase considerably in value at a comparatively low cost, since, except in hill districts, there will be no need to yard spring-born calves in their second winter, unless they are required to tread straw into muck.

Home-produced Beef in relation to World Supplies

A 12-cwt. bullock at the present time should be worth, say, £66 at three years old. This represents an average increase in value of £22 a year (disregarding its value at birth), and taking into account the very cheap middle period from weaning to the beginning of feeding, there should be a useful profit over the full period of its life. That cattlemen agree with this opinion is suggested by the increase in the numbers of young cattle being reared at the present time. A comparison of the numbers of steer and heifer calves at September 4, 1947, and 1948, respectively, shows a 36 per cent increase in the number of steer calves and an 18 per cent increase in heifers. (However, the actual increase in numbers of heifers, 180,000, was much greater than the increase in steers, 100,000).

On the other hand, it has to be remembered that these profits and increases in numbers are themselves largely the result of price increases and subsidies which make home-killed beef a very dear article, compared with the world price. Figures recently given in Parliament are that home-killed beef costs £136.08 per ton, compared with £68.25 to £79.75 per ton for imported beef, mainly Argentine frozen beef.* In addition, the home-rearer receives the subsidy on calves, the hill cattleman receives a special subsidy, and concentrated feedingstuffs, in spite of the recent reduction in their subsidy, are still below the price which they cost the Government.

But although these facts show that the price of home-produced beef is very much above the world price, there is no reason for the home farmer to fear competition in the immediate future. It has become only too painfully apparent in recent months that there is no more meat to be had than we are getting now, nor do the high prices of British beef divert consumption to something that is cheaper, because it is not the consumer who pays the difference in price. The consumer pays a price which is the same whether the beef is imported or home-produced, prime steer or cow—and the taxpayer pays the rest. From this it follows that, under the present system, there is no danger of an increase in prices to the producer being reflected in a reduced demand. (Nor is that very useful barometer, price, any longer able to measure the consumer's real demand for the commodity.)

* The recent agreement with the Argentine, however, raises the price of beef from that country to £96 per metric ton—10½d. per lb.

There seems no likelihood at present, then, of the high price of home-produced beef proving detrimental to the demand for it ; and in spite of its cost, farmers are being urged to produce more and more beef to meet the country's need. Yet however favourable the short-term outlook may be, it is impossible not to have some fears for the future when such a disparity between prices for home-grown and imported beef persists. We know the Government is financing a huge scheme for increasing beef production in Australia for this market, we know they are interesting themselves in the possibilities of developing cattle ranches in Africa, and we know the desire of France to become an exporter of meat to us. And although the favourable terms of trade which the Argentine now enjoys have enabled her to keep back for home consumption meat which before the war she would have sent to us, it is unlikely that she will be able to maintain her present favourable position if world supplies of food become more plentiful and prices of food fall in relation to other commodities.

If world supplies of meat improve and more becomes available, considerable pressure will almost certainly be exerted on the Government to buy as much as it can where it can be bought cheapest, and the home producer must be prepared to face the foreigner, if not on equal terms, at least on the basis of prices which show much less disparity than today's. It is, in fact, very unlikely that today's margin between prices and costs will be maintained unless costs can be reduced (although the 1947 Agriculture Act guarantees that fair warning of any downward revision will be given in the annual February Price Reviews). The rest of this article is devoted to a discussion of some of the ways in which a reduction in costs may be achieved.

Lower Fattening Costs There is no doubt that improvements in rationing winter-fed bullocks could often be undertaken. A report(5) published in 1946 by the Midland Agricultural College (as it then was) shows that the amount of protein fed to the cattle costed in that year was almost 17 per cent greater than it need have been. This report suggests, too, that the stock might have been more thrifty if the interest which the modern stockman takes in his work had been up to the standard of a former generation. The difficulties of seeing that the stock are properly bedded down on Sunday and the unwillingness which many men show for weekend work contributed to the poor returns the cattle showed on the food fed to them.

It is less easy to criticize the rations fed in summer, since the only food for many years now has been grass. Yet this itself indicates the importance of grassland management. Farmers do not need to be reminded of the importance of harrowing, ditching, draining, making hedges stock-proof, and I believe it is still the practice on some of the best pastures to collect and spread again the droppings to keep the pastures sweet. In addition, there is the question of manuring and often of ploughing out old pastures and reseeding them. A famous Midland farmer once epitomized the problem of grassland and cattle in this JOURNAL as follows: "Make your pasture and the cattle will get fat on it"(6).

But there is the equally important question of what sort of cattle to rear and fatten, and how to fatten them. Farming systems and practices are always changing. When winter feeding became too expensive the method was changed so that the beasts ran store throughout the winter and were finished on grass. It was possible to do this at a profit even before the rise in prices in August, 1947. The most recent change in the price schedule, with its peak earlier in the season, may, however, encourage farmers to market rather more cattle direct from the yards instead of finishing them on grass.

Another change in methods was brought about by the scarcity and high prices of Irish stores. Of late, many farmers who used to buy big bullocks to feed have preferred to rear their own stores. At present prices most farmers should have no difficulty in rearing their own stores at a profit, but it is doubtful if this could have been said before the effect of the rise in fat cattle prices in 1947 was reflected in the store trade. If costs of beef production are to be reduced, much of the saving must be in cheaper rearing.

Single suckling is a very expensive way of rearing calves if any quantity of hand meat is fed to the cows; the costs of housing them in winter can be justified, if at all, only by its indirect advantages.

If more than one calf is reared the cost of the cow is spread over a greater number of calves, but the amount of labour required in attendance is considerably greater than with single suckling, and it is often difficult to find a supply of calves suitable for rearing. The same is true of pail rearing. It is overcome to some extent by breeding from dual-purpose herds, or by using beef bulls on dairy herds. The second of these alternatives can be applied only to flying herds; it would be fatal on herds rearing their own replacements.

The plane of feeding is the subject of an experiment on the Cambridge University farm, and interim results suggest that success in rearing depends largely on giving the calves a good start.

The well-run dual-purpose herd is a satisfactory way of getting a calf which is well enough bred to turn into beef from a cow which will earn her keep as a milk producer while she carries and later rears the calf. Considerably more skill, however, is needed to maintain a successful dual-purpose herd than a single-purpose herd, either milk or beef. In the U.S.A. and Canada much less crossing between beef and dairy breeds is done than in this country, and little attempt is made there to develop dual-purpose qualities; and it is probably not just coincidence that the average yield of cows in the eastern states of the U.S.A. and the dairying provinces of Canada is some 200 gallons per cow greater than ours. No one can deny that in this country there are some very fine herds of dual-purpose cattle, but taking the country as a whole it is evident that the attempt to achieve dual purpose has too often led to an animal which can only be described as "no purpose".

For many years now the emphasis has been on milk, and there is much to suggest that where the dairy animal and the beef animal compete for land, labour, or stall space, the preference should be given to the dairy animal. Thus the animal nutritionist shows that the dairy cow is a much more economical converter of vegetable matter into human food than the bullock, and the dietician has established that milk has particular virtues for certain classes of the population, which put it in a class by itself. Prices, too, are such that a dairy cow, enjoying an average life of three lactations, will in its life of six years produce per year twice as much gross as could be expected annually of a three-year-old bullock. In fact, the only advantages of the bullock over the dairy cow are its lower labour requirements, its ability to turn coarse food into beef more satisfactorily than the cow can turn it into milk, and its undoubted pre-eminence as a treader of straw into manure.

Unless, therefore, the future leads us into a glut of milk while beef remains relatively scarce, land, labour, and capital are generally likely to be better employed in dairying than in maintaining cows to rear beef cattle. The exceptions are likely to be those farms which are not suitable for dairying and those which can make a satisfactory income without the help of the dairy cow.

But if the supply of home-bred beef is to be maintained, even at its present figure, some steers will have to be reared from dairy cows. The difficulty will be to find stores sufficiently well bred. Some bullock feeders are, however, already buying calves to rear from cows which, although kept for milk production, will yet breed a calf good enough to rear for beef. An interesting account of a Friesian herd that is used for this purpose as well as for milk production appeared in the December, 1947, number of this JOURNAL(7), and several graziers have found steers of the same breed satisfactory. Their advantage lies partly in their size, since they will weigh 14 cwt. or more live weight, while beasts of the same age from other breeds will weigh 11 or 12 cwt. Such rearers will be put on their mettle when the price for beasts of more than 13¾ cwt. live weight will be reduced by 5s. per cwt. next October. If they carry this handicap and still provide as good returns as the lighter weights, they will have gone far towards solving the problem of the most suitable type of beast to rear for post-war conditions.

References

1. THOMAS, W. J. Wartime Fattening of Cattle in Wales. *Agriculture* (1945), **52**, 345.
2. BLACK, D. and OLDERSHAW, A. W. Farmyard Manure I. *Agriculture* (1945), **51**, 487, and MACGREGOR, J. J. *Economic Aspects of Beef Production and Consumption, Harper Adams Agricultural College* (1945), 6.
3. UNIVERSITY OF NOTTINGHAM SCHOOL OF AGRICULTURE. *Grass Feed Cattle Investigation, 1946 and 1947 Results* (March, 1948).
4. BUTLER, J. B. *Costs and Returns for Wintered Cattle in Northumberland, 1946-47. Report No. G26.*
5. BOND, W. and MAKINGS, S. M. *The Economics of Yard Cattle Feeding under War Conditions* (Midland Agricultural College, 1946).
6. ASTILL P. F. Fattening Cattle on Pasture. *Agriculture* (1940), **47**, 9.
7. HODDELL, G. P. J. Friesian Bullocks for the Fat Market. *Agriculture* (1947), **54**, 402.

INTENSIVE LEY FARMING FOR MILK

MAITLAND MACKIE, Jnr.
Rothienorman, Aberdeenshire

I HAVE two farms which are run as one unit of 750 acres, with very varying types and depths of soil on it. It rises from 300 to 800 feet above sea level and has a rainfall of roughly 30 inches. It is a dairy farm carrying some 230 Friesian cows and their followers, although at the moment we are carrying only 470 cattle all told. We grow 240 acres of oats and 12 acres of potatoes every year. There are no roots for the cows and, therefore, we are left with about 500 acres of grass which I am hoping will maintain this stocking summer and winter.

For the last two winters I have had to supplement the grass silage with about one ton of wet distillers' grains per milking cow. That leaves room for improvement and an incentive to still better grass. Having decided it was unprofitable to grow roots for winter food, the whole problem became one of using as small an acreage of grass as possible for grazing and conserving what was left as hay and silage.

Three years ago, after many failures with hay, I decided to drop haymaking altogether because I could see that I could always make good silage; that even hay made on tripods and put up very green was never nearly as good as the stuff I cut and, even if it were past the stage for the best silage, I could still make it into silage which would analyse better than hay and there would be no worries about the weather.

Seeding without a Nurse Crop My advice therefore on haymaking is very simple—don't, but if you do, make it on tripods and put it up green. I now lay down roughly 125 acres of grass every year, and all of this has been sown without a nurse crop in the sense of a cash nurse crop. Last year I did sow one bushel of bere along with the seeds to get a quicker bulk of stuff to cut. All kinds of annual weeds come up with the seeds the first time, and the sooner they are cut the better chance the grass gets, and in time I hope we will get rid of these annual weeds. At least they make grand silage along with the growing grasses and are never seen again in that rotation. I have another very important reason for not sowing with a nurse crop: which is, that after the first cut of silage the grasses come up vigorously and are just right for grazing about August 1 when the older grass, no matter how good it looks, is apparently not good enough for milk, as shown by the number of gallons in the cans. The cows then get this second growth to graze, and for the last three years I have been able to stop the usual drop in milk which used to occur at the end of summer and have kept them milking without additional green food up to the end of September, when we start feeding the silage. This, I think, is particularly valuable because in the past one often knew that the cows should be getting some kale, turnips or cabbage to supplement end-of-August and September grass; but because the whole energies of the outside staff were directed to getting on with the harvest I could always invent a very plausible reason for not doing so for another week, then another, and so on till harvest was over and the damage had been done. I have departed from this system this year because I see that enough fertility has been built up in the grass fields to yield three good white crops in succession. This, of course, is a great saving, since I shall have to sow down each year only one-third of the acreage instead of one-half. As I have missed the young, vigorous, resown grasses to which I referred, I have tried manuring heavily with nitrogen some of the older pastures, but although the result looks good, I do not think the milk cans are going to tell such a good story as they do on the new stuff.

I have been using simple mixtures for the last three years, for various reasons. The first reason seems obvious: 13 lb. of a mixture, even with the addition of a little bere or Italian ryegrass, is very much cheaper than the 30 lb. of various grasses and clovers which I used to sow. Second, if various fields are more suited to certain grasses it seemed sensible to sow only that grass and so get as near to a maximum crop as possible. Third, if grazing and management of a mixture of grasses is the complicated difficult business it is said to be, then, in order to retain the original proportion of grasses, the answer was apparently to grow the grasses in that proportion but to sow them in different plots; they would not then suffer from competition and could be cut or grazed at the proper time for each grass and rested at the proper time, which seems just as important. For the last two years, only the Aberystwyth S strains have been used, sowing 10 lb. of either cocksfoot or perennial ryegrass or timothy with the addition of 3 lb. of S.100 white clover. In some of the plots we put down a strip of the much-talked-about

deep-rooting herbs—burnet, chicory, plantain, etc.—but I have no fixed ideas about their value. Two strains of each grass are sown—an early and a late strain ; and this seems a good thing in spreading out the grazing or in keeping back some fields for cutting until the early ones are finished—another good reason for sowing each grass and each strain separately. Restricted rotational grazing is carried on from the time the milking cows go out in April until August, when the second growth from the young grass is ready. Rotational grazing is thenceforward unrestricted, as by that time I can spare more acres and the grass is less rich and no harm is done by the cows taking their fill. Restricted grazing allows me to graze the cows on about ½ acre per cow up to this time, and this releases a lot of grass for silage-making.

Manuring After many trials and troubles my manuring has now settled down to a fairly regular system. In sowing down to grass I merely apply 6 cwt. potato manure and give 3 cwt. nitrogen after the first cut is taken off. At the end of harvest we start putting all the dung on this grass. The earlier I can put on the dung the better I like it. For one thing, as long as a little of the growing season is left, the young grasses seem to respond best to the dung and little will be lost through drainage ; and for another, if the fields are well and truly dunged with about 20 tons to the acre, I am not tempted to let the cattle still left out in October graze them, for the simple reason that they will hardly eat off them—and who could blame the cattle? To the fields that have not got dung in the back-end I try to give 3 cwt. potassic superphosphate. When this was difficult to get, ordinary superphosphate was used. In spring, say March, half the grass acreage will get 5 cwt. of potato manure. Probably all the grass should get this, but with a farmer's natural antipathy to spending money, I persuade myself that in its last year I want to reduce the fertility by manuring heavily with nitrogen and cutting three times for silage, and that in its first year the dung will do instead. The other half of the grass, i.e., roughly second and fourth year grass, will get 2 cwt. nitrogen. Manuring throughout the season depends to some extent on conditions at the time, but roughly I have come to the conclusion that heavy dressings of nitrogen are very profitable after each cut of silage. Last year our best result was from 4 cwt. There seemed little difference between four and five. The rotational plots for the grazing animals are given 2 cwt. of nitrogen only as needed to keep pace with the cows.

The Mechanics of Making Grass Silage One of the bugbears of a root crop for winter feed was the lifting and driving in all winter. Grass silage has certainly simplified this, as I have placed the silage pits for the milking cows right at the cowshed doors. The cattlemen simply take the silage straight from the pit to the cow. As far as the mechanics of making grass silage are concerned, I used to say the best way was to borrow someone else's cutlift, but owners of cutlifts are now becoming very diffident about lending them, so I have one of my own. This machine used to suffer from too much vibration, and for one year we abandoned it in favour of a crop-loader. After some alterations on the farm, however, we have brought it into service again, and for the last two years it has done very good work. When properly adjusted it seems to be still the best I have tried. It cuts cleanly, picks up everything and deals with different stages of grass better than the crop-loaders. We now work two squads during the season, one with the cutlift and one with a mower and loader. The crop-loader is kept as a standby. I have tried to save a

tractor by having the crop-loader coupled to the mower with a special hitch. This works quite well, but in the end I abandoned it because it was most annoying to see the whole business held up because of a broken finger in the mower—a frequent occurrence on our stony ground. I find it better to pay the tractorman to cut ahead of the crop lifter at dinner-time and evenings when a breakdown of the mower will then affect only the one man and one tractor. The same fault, of course, applies to the cutlift, but this is compensated by its clean lifting properties. We have some fields about three-quarters of a mile from the pits, so the number of tractors needed to keep the two units going varies. Close at hand two can do it ; farther off we need three. At the pit, if the tractors driving the grass from the field have time to do it, each tractorman, with the assistance of the man at the pit, forks off his own load. This is rather wasteful of time and labour, but it makes even distribution and tramping possible. If the carting tractors are pushed for time, I have pulled off the load with a double rope previously laid along the bottom of the cart and then over the top of the finished load. This rope can be attached to a fixture at the back of the pit, and the tractor pulls off its own load, but generally wheelslip on the soft grass makes this unsatisfactory, and another tractor, in this case a crawler, is used to pull off the loads and do the subsequent consolidating.

All this looks like a lot of labour and machinery, but several points must be kept in mind. First, silage could be made more economically in the field where the grass is grown, but I find the convenience of having the finished product beside the byre worth the extra trouble and expense. Second, I believe each field is only at the right stage for making good quality silage for such a short time that each cut must be handled speedily. With 200 acres to deal with three times a year, we set 10 acres a day as a minimum to handle. To get this done with the type of equipment available, I have to employ two more or less complete squads and equipments. I think there is a crying need for a machine which will cut, chop and load varying heights and thicknesses of crops at a rate of not less than 10 acres per 8 hours. Last year I tried out an American forage harvester, which promised to do this, but I found it most unsatisfactory, especially in short grass, as the feed into the cutter kept choking. We did manage to reduce the labour by having made special low-loading, high-sided carts which one boy or a man could load, but with a cutter-blower no one should be needed in the cart at all. Also, with loads already chopped, they can be pulled off at the pit and fall automatically into place without much spreading. I think this is a very pressing problem, for, with proper equipment, I am sure the rate of cutting could be maintained with half the labour.

Labour Spread I find that silage-making in summer clashes with the cultivations and work on a root crop. Theoretically, by the time the root crop is sown, the first cut of silage should be ready. Then, by the time the roots are ready for singling, the first cut should be finished, and when singling is over more silage can be made ; after that, land cleaning of the root crop can go on until a further cut or hay comes on. In practice, the two often coincided and neither root singling nor silage-making is an operation that can wait. The result was either the spoiling of one crop or employing a lot of casual labour. In most districts casual labour is difficult to get, expensive to employ and, in any case, a bad thing for the country. We should try to base our production and work for the year on a regular staff, and ensilage or grass drying without roots for stock-feeding seems to make this generally possible. Although I have not yet got the silage-making sufficiently mechanized, I can see it coming, and it does leave

the staff free for much longer periods than in the days of the root crop for the hundred and one other jobs which have to be done. The work spreads itself well throughout the year. With grass as the basis of the summer work, by sowing single grass mixtures with different periods of growth, and by the planned application of manures, we can spread out the handling of the crop so that all is eaten or conserved as nearly as possible at the right times. Taking the eight months of the year from March 1 to the end of October, there are about 189 full working days, and if we take the major operations which employ the whole staff for that time, I think we ought to be able to do them in 145 days, spread out roughly as follows:

Putting in crop and laying down grass seeds from March 1 to April 10, say 21 days out of 32 available.
Driving out muck from sheds before May 1: 14 days. (17 days available).
Silage-making or grass drying first; second and half third cuts before August 1: 50 days. (67 days available).
Harvest, potatoes and half third cut before October 8: 46 days. (55 days available).
Drive out muck from sheds before October 31: 14 days. (18 days available).

These figures correspond roughly to my timetable last year. They would, of course, be different for other districts, and many farms would have other major operations to fit into the schedule. I put them forward only as an indication of the fairly even spread of days throughout the whole season left to do the many other jobs on the farm which do not call for the whole outside staff. These days make possible the extra manuring and extra fencing needed to ensure maximum production and maximum use of our grass. The result of our summer's work in having already got our stock feed ready for consumption beside the animal is that the winter's work is simplified considerably. Liming, threshing, potato dressing, dunging the grass and, of course, ploughing, occupy the staff fairly regularly, but the time formerly spent on carting roots can now be spent on all the extras we have intended doing but never seemed to get round to. Last back-end, which was particularly fine, I was able to build two fairly big sheds, mostly with my own labour, in addition to a lot of odd jobs that had been badly neglected.

One Acre, One Cow, One Year That, then, is roughly what I have been trying to do with my grass. I would now just like to run over what I think should and could be done with this crop. First, I think we should aim at making one acre of grass keep one adult animal for a whole year. This may appear ambitious, but I am sure it can be done. I think we could summer the animal on half an acre and conserve the other half, either as silage or dried grass for winter keep. This cannot be done without fairly heavy dressings of fertilizers. The grass must also get the dung in its first year and preferably be put on early in the end of the year. All grass that doesn't get dung should get some potash and phosphate in the end of the season to stock up the root system so that growth will start with the first breath of spring. The soil should, of course, be tested and the liming and manuring adjusted accordingly.

In the main I think it is profitable to sow the grass seeds without a nurse crop, although there is a loss of some six to eight weeks at the beginning of the season. This loss, I think, is easily compensated by the value of the late growth of reseeded pasture and by the fact that one can grow a full crop of grain in the previous year without fear of spoiling the grass seeds, either by shading or lodging of the crop. Two methods can be employed to lengthen the grazing season at both ends and to spread out the work of conserving the grass for winter. First, sowing single grass mixtures which will come at different times. Each plot of different strains to be grazed should be fenced separately and eaten on a rotational system and rested at the appropriate

time to suit its next season's growth. The fields set aside for cutting (also sown with different strains) will come to the optimum stage for conserving at different times with all the plants in the field at the same stage whereas, in a comprehensive mixture of grass, some are bound to be too mature and some not mature when cut, so lowering the value of the product and incidentally altering the proportions of the grasses for the next cut.

In laying down these simple mixtures at a low seed rate, I find the most important thing is to have all the work in making and manuring the land finished, then roll once or twice with a Cambridge roller, broadcast the seeds in the ridges, cover with a light chain harrow pulled along with the broadcast sower, and roll again twice. I have tried drilling the seeds without much success, probably because I put the drills too far in.

At the expense of a little more work I like to make the finished product where it is going to be used. I cannot see any place for haymaking because, although it is easy to mechanize, the finished product is rarely as good as it should be and never as good as silage or dried grass. A better forage harvester is needed, but in the meantime a cutlift or green crop-loader with special carts makes quite a good job. Where possible, the pits for silage should have cement sides and hold at least 6 feet of settled silage, because the top is always more difficult to consolidate and the less there is of it the better. Sisal paper and cement slabs make a good covering. The slabs are expensive but very convenient to put on and take off; it is easy to remove them after a first cut has been put in and settled and another cut made on top of the first. If soil is used, a tractor scoop will save most of the hand labour. I do not think silage-making fits in well with growing roots, and I would cut out the winter root crop altogether, which then simplifies both summer and winter work. I believe that if the goal of one beast per acre were achieved the amount of dung which would be made would eventually reduce the amount of artificial manures which needs at present to be applied. In an attempt to reduce the fertilizer bill I had the idea of folding hens over the grass once in the rotation, but so far I have only 1,000 hens in folds. These birds will cover only about 30 acres in a year, but already in a field I imagined was in good heart and had good grass you can see the difference the humble hen has made. Incidentally, they did not reduce the amount of available grazing at all.

AGRICULTURAL INDEX NUMBER

MONTHLY INDEX NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS INCLUDING GOVERNMENT GRANTS. (BASE 1927–29 = 100)

Month	Uncorrected for Seasonal Variation					*Corrected for Seasonal Variation*				
	1939	1946	1947	1948	1949	*1939*	*1946*	*1947*	*1948*	*1949*
January ..	96	199	217	241†	245†	*89*	*179*	*193*	*215†*	*218†*
February	94	201	211	240†	243†	*88*	*182*	*190*	*217†*	*220†*
March ..	90	192	201	232†	238†	*91*	*183*	*191*	*220†*	*225†*
April ..	90	176	186	214†	228†	*95*	*182*	*192*	*223†*	*237†*
May ..	82	162	171	198†	208†	*91*	*181*	*192*	*222†*	*236†*
June ..	80	161	170	197†	207†	*89*	*181*	*193*	*225†*	*237†*
July ..	85	168	181†	198†		*93*	*182*	*197†*	*216†*	
August ..	87	176	192†	211†		*91*	*191*	*208†*	*228†*	
September	93	177	206†	210†		*93*	*188*	*222†*	*227†*	
October ..	97	192	221†	226†		*92*	*187*	*215†*	*220†*	
November	107	209	235†	239†		*98*	*192*	*217†*	*221†*	
December	114	214	241†	245†		*104*	*192*	*216†*	*221†*	

† Provisional.

THE USE OF RECORDS IN BREEDING DAIRY CATTLE IN DENMARK AND THE NETHERLANDS

E. D. Ashton

Bureau of Records, Milk Marketing Board

AT no time have the problems of the British breeder of dairy cattle been so fully realized as they are today, and at no time has there been such unanimity about the broad lines along which they should be tackled. Future progress depends on co-operation between all the groups interested—the professional breeder, the commercial producer and the scientist—and recent events have shown that we may expect the co-operation to be close and fruitful. The instruments of progress lie in study and selection based on detailed factual evidence, and the aim is to build strains of superior breeding stock as a foundation of our national herd.

Both our neighbours, Denmark and the Netherlands, have had long experience of this kind of policy—the application of breeding data on a national scale to livestock problems. It is interesting to see the progress they have made and how this has been achieved. The farming pattern in both countries is one of heavily stocked smallholdings devoted to intensive and specialized dairying. The dairy breeds are few and cross-breeding scarcely exists.

The location of each breed is concentrated rather than scattered. In the two main Danish islands of Zealand and Fyn, for instance, of 550,000 cows, 530,000 are of Red Danish breed. In the Netherlands whole provinces are populated entirely by the Black and White Holland breed; the Red and White breed is concentrated in the south-eastern corner of the country, north of the great rivers along the German frontier; Gronigen cattle are found in the province of that name, with a small enclave in the province of South Holland. Boundaries between the breeds are clear, and only very small areas are populated by more than one breed. No doubt such a concentration is the result of slow development over many years and has been influenced largely by uniformity of soil types. The Black and White Holland breed, for example, is found on the better land which has in recent centuries been reclaimed; the Red and White (M.R.Y.), with a less developed milking capacity, is adapted more to the lighter soils of the South and East.

The methodical keeping of ancestry records and their publication has been going on in both countries since the end of the last century. In both, the milk recording service has been harnessed to breeding on a national scale since before the first world war, with the result that strains of breeding stock have been developed with yields of 200-400 gallons above the national average.

Denmark There is little doubt that the Danish system is administratively the simplest arrangement for using records *en masse* in breeding work. Here the responsibility for the production of Herd Books and for the milk recording service lies in two branches of the same organization—the Danish Association of Agricultural Societies. The provincial offices of the two branches are usually in the same town, and in one case are under the same roof and under the supervision of the same official. At field level the relationship continues to be very close, frequently involving the same member of the staff in duties covering milk recording and breeding advisory work.

This traditional alliance between milk recording and breeding is at the foundation of Herd Book work. The Family Herd Book, for instance, is compiled when a herd has been recorded for three generations and the type

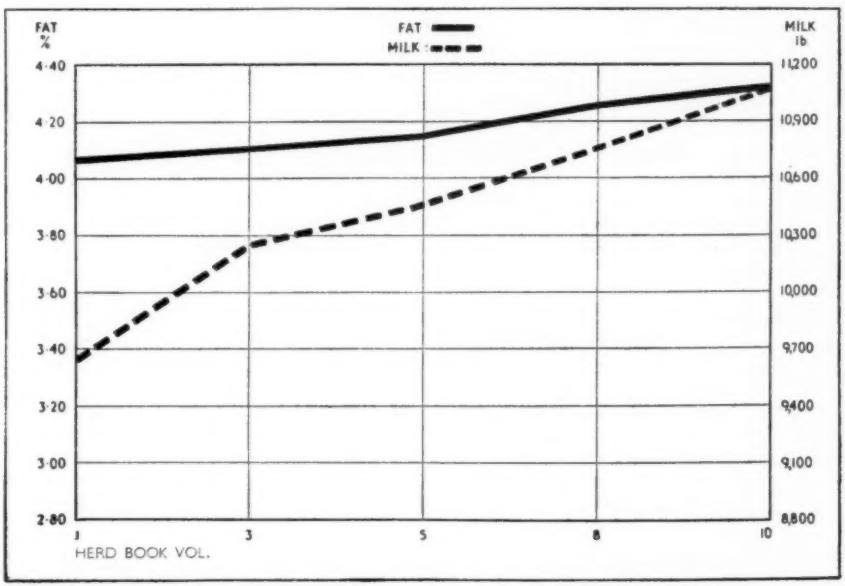
of animal is considered satisfactory. This book is kept up to date each year by officials of the Danish Agricultural Societies, and it forms the basis of the published Herd Books for Young Animals, for Cows and for Bulls. Registered cows and bulls must conform to standards of performance and type prescribed by the D.A.A.S. Cows must have produced at least 880 lb. of fat in two successive years. With bulls, the yield of fat of the daughters must show an increase on their dams or be at least 350 lb. of fat for the average of first and second records, or 396 lb. of fat for mature records. Conformation standards are in terms of measurements—height, depth of chest, length of body, and so on.

Herd Book standards are not static but are reviewed each year to preserve the elite character of the Herd Book. The degree of selection is great : annual entries in the Cow Herd Book of the Red Danish breed can be counted in hundreds, although there are some half a million cows of this breed which have been recorded for a number of generations.

The effect of such a rigid process of selection is illustrated by the graph below—a steadily rising trend for both milk and butterfat content has been maintained.

The Red Danish Bull Herd Book is a typical example. The 1942 edition, for example, is a well-produced book of 190 pages containing information on the 96 bulls registered for that year. Some of the facts disclosed are worth reproducing :

1. 52 of the bulls are in direct male line to one bull, and the other 44 are descendants of another bull. Both bulls are well known all over Denmark.
2. On average the 96 dams milked for between six and seven lactations.
3. The most frequent calving at which the bulls were born was the second.



Source—Red Danish Cattle Herd Book, Vol. 10, 1930.

The outstanding feature of this Herd Book is the wealth of information, both on the ancestry side, denoting emphasis on longevity and records, and also on the progeny side, in conformity with the prescribed standards. It is this wealth of information which accounts for the advanced stage reached in establishing strains of breeding stock.

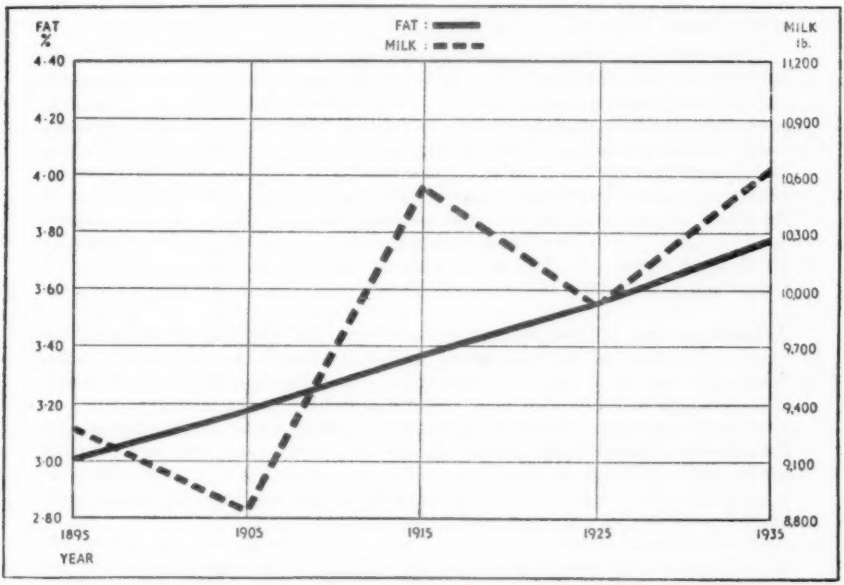
While Herd Books are restricted to well-ordered details of a very few elite animals, the published reports of the Milk Recording Associations give full publicity to the performance of recorded herds and of males and females in those herds. As milk recording covers 50 per cent of the cattle in the country, detailed information on performance of the more important half of the national herd is available each year.

Government action has been restricted to giving financial assistance from time to time (and until the recent war on a very limited scale) to local Recording and Cattle Breeding (i.e., bull clubs) Societies. The activities of Breed Societies do not usually extend beyond breed publicity : the term pedigree, as it is used in this country, is unknown.

The Netherlands Here a rather more complicated administrative structure has prevailed, because two separate organizations have existed for the production of Herd Books and for Milk Recording. In addition, the State has taken an increasing interest, particularly in recent years, in breeding and recording.

Breed Societies, as such, have always had a very important influence on cattle breeding, and their membership, which has advanced rapidly in recent years, now exceeds 30,000 for the three breeds. They are responsible for Herd Books.

The Netherlands Cattle Herd Book Society (N.R.S.), operating from its office at The Hague, is responsible for Herd Books for all three breeds and covers



Source—*The Black and White Friesian Cattle*, a pamphlet published by Leeuwarden Herd Book Office.

the entire country, except the province of Friesland which, in its own office at Leeuwarden, produces a separate Herd Book for the Black and White Holland breed in that province. At these two offices, registers of young cattle and of cows without full pedigree are kept. Herd Books are published for pedigree cows and bulls.

Calves entered in the register of Young Cattle must have registered parents and bull calves, and must be from ancestry with yield qualifications. The register of cows without full pedigree is much the same as a Grading Register in this country, except that the standards are based on conformation only. Entries in the Herd Book proper must have appeared previously in the register of Young Cattle and must comply with detailed standards of conformation, which include a consideration of head, legs, milk indicators, and general appearance. These standards have had the effect of restricting the number of entries and of raising the general quality level.

In addition to Herd Book entries, a special merit list is published. This includes cows reaching certain standards of yield as well as of conformation, and bulls proved for both.

In recent years the State has taken considerable interest in cattle breeding. By the operation of a Premium Bull Scheme since 1943 (when 136 bulls were awarded a premium) and by the establishment of State-sponsored "Commissioners for Stockbreeding" for the study of old bulls, it has made known and extended the influence of the best bulls in the country. This work is carried out in close co-operation with the Herd Book authorities, and the detailed information in these Commissioners' reports on good bulls is an important feature of the Dutch livestock industry. Dutch authorities were able to point to two outstanding sires of the Black and White Holland breed, one in the Netherlands Herd Book and the other in the Friesland Herd Book, which have had the most beneficial effect on the breed. These animals would not have been given the prominence they deserved if the full arrangements for studying bulls had not been operating.

The Milk Recording service is carried out independently of Herd Book Societies through the Association of Dairy Factories under a State inspectorate and with State financial backing. The operational unit, as in Denmark, is the local milk recording society (a recorder's circuit) and local societies are grouped together into eleven Provincial Associations which have, since 1943, been brought together under a central office at Arnhem, covering all provinces except Friesland. The service, which now covers 36 per cent of the cows in the country, has always been influenced by the Herd Book Societies, and the administrative arrangements are fashioned to facilitate Herd Book work. Further developments in dissemination of information have been planned by the central office.

Achievements These two countries occupy a leading place in the breeding of dairy cattle. In both, breeding plans have been developed ever since the establishment of Herd Books and the formulation of a standard technique for milk recording and butterfat testing in the late nineteenth century. There is an apparent difference in emphasis on conformation and yield in the two countries; the Netherlands appears to stress the former, and Denmark the latter. The extent of this difference, however, is very difficult to assess. In the Netherlands, for instance, all young bulls must be out of dams and grand-dams with good production records; hence every breeder interested in breeding bulls automatically sees to the yields of his females. Moreover, all elite cows and bulls must qualify on production as well as on conformation. In Denmark, on the other hand, in spite of the apparent attachment to yield, the basis of all breeding work is the Family

Herd Book, use of which is restricted to herds approved on the basis of conformation. The difference, therefore, seems to be more apparent than real.

There can, however, be no mistake about the common purpose of these two countries. Both have tried to breed an economical producer of butter fat, and the broad lines of policy have been identical—the assembly of a multitude of facts on ancestry and progeny and the creation of a carefully selected elite breeding stock. The administrative details have been divergent, but now, after fifty years' work, they have both reached practically the same stage of development. The explanation of such an achievement lies in the use of the two instruments, study and selection.

THE GRASSLANDS OF DENMARK

DUDLEY E. EYLES, B.Sc. and T. A. EVANS, B.Sc.
Grassland Research Station, Stratford-on-Avon

DENMARK is a small country, about twice the size of Wales. Of this, Jutland represents two-thirds of the total area, and the remaining third consists of islands, the two largest being Funen and Zealand. The climate is similar to that of the eastern counties of England, except that the winters are more severe. The country is very flat and windswept, the highest hills not exceeding 500 feet above sea level. In general, the soils of north and west Jutland are represented by light loams, while the soils of the islands and the rest of Jutland are heavier. These soils are easily worked but are not inherently fertile.

General Farming Denmark has no mineral or coal deposits, so that the Danes have been forced to make the best use of their chief raw material—the soil. A quarter of her population of four millions is engaged in agriculture, the agricultural area occupying three-quarters of the country. Agriculture has displaced the forests and heaths to such an extent that only 6.9 per cent of the land surface is not usefully employed. Farming is intensive. The average size of a farm is 43 acres ; half the farms are under 25 acres and only one per cent are over 250 acres.

The mainstay of the agricultural industry is the dairy cow, with pigs and poultry forming subsidiary enterprises. Most of the milk produced is made into butter and cheese at co-operative factories, and the skimmed milk and whey are fed to pigs. During the war, the number of dairy stock was maintained at pre-war levels but, as feedingstuffs could not be imported, the pig and poultry populations were severely depleted.

Allocation of the Agricultural Area For comparative purposes the percentages of agricultural area occupied in 1945 by arable land and by grassland in Denmark and in England and Wales respectively are given below :

	Denmark	England and Wales
Permanent pasture (including rough grazings)	15	51.4
Arable	62	37.0
Ley	23	11.6

Arable and ley are obviously most important in the Danish farming system. Compared with England and Wales, the percentage of permanent grass is very low. The reason for this is the low yield per acre from permanent pasture. Permanent grass is mainly situated on land which is difficult to cultivate, such as the marshes and moorland peats. In West Jutland, which has a higher rainfall and several areas unsuitable for arable cultivation, permanent pasture occupies a larger percentage of the total area. A farm may have one permanent grass field near the buildings. The permanent pastures are usually of poor quality, being dominated by bent (*Agrostis* sp.) and meadow grasses (*Poa* sp.), and associated with *Festuca rubra* on the drier soils and *Deschampsia caespitosa* on the wetter soils.

Most of the crops are grown for livestock consumption. The rotations are generally seven or eight course, e.g., oats-wheat-roots-barley-sugar beet-barley-ley-ley. A long rotation is desired, since *Sclerotinia* (clover rot) and eelworm infestation of clover are widespread. The ley occupies two years and is essentially a hay ley.

This is a typical mixture used for a two-year hay ley :

	lb. per acre
Perennial ryegrass	4
Timothy	4
Meadow fescue	2
Red clover	9
White clover (Morsø)	2
TOTAL	21

The high seeding of red clover ensures a hay crop containing a high percentage of clover in spite of winter killing, clover stem rot and eelworm attack. Early and medium-late strains of red clover are used. In a severe winter the early strains are killed. "Morsø," a Danish type of white clover, is more productive than English wild white, but persists for only three or four years. The grasses have been bred for high yield of dry matter and are of a stemmy hay type. Italian ryegrass is not sufficiently winter hardy and is not therefore included in the mixture; even perennial ryegrass is killed during severe winters. The total rate of seeding is similar to that commonly used in Britain, the main difference being in the high proportion of legume to grass.

The hay ley is everywhere broadcast under a cereal—usually barley. The young seeds are not grazed either in the autumn or in the spring, and an early hay cut is taken. The hay is cured on tripods in order to preserve the leaf. Every cowshed has its loft in which the hay is stored ; a hayrick is a rare sight. The aftermath is grazed by dairy cows, the traditional practice being to tether the animals in line across the field. On the larger farms some use is made of electric fencing.

Lucerne The acreage of lucerne grown in Denmark in 1945 was 64,467. The main varieties used are Canadian Grimm and improved Danish strains derived from crossing the former with *Medicago falcata*. Recent experiments indicate that Dupuits, a French strain, is likely to give a higher yield of dry matter and to be a better producer of seed than varieties previously in use.

Lucerne is usually sown in narrow drills under barley at a rate of 22 lb. per acre. Sometimes 1 lb. per acre of timothy is added in order to fill the bare ground which would otherwise be colonized by weeds. Lucerne seed is always inoculated with the appropriate strain of bacteria. This helps to ensure good establishment, which might otherwise be poor owing to severe

winters and *Verticillium* wilt. The latter was first recorded in 1941 and is now of more frequent occurrence. To ensure some hay if the lucerne fails, 2 lb. per acre of red clover is often added to the seeds mixture. Three hay cuts per year are taken and the ley is rarely grazed. Four cwt. per acre of potash salts and 3 cwt. per acre of superphosphate are applied after the last cut of the season. The duration of the lucerne ley is three or four years.

Pasture Leys At present the Danes do not employ grazing leys to any material extent. The following is a typical mixture designed for a long-duration grazing ley :

	lb. per acre
Perennial ryegrass	5
Meadow fescue	9
Smooth-stalked meadow grass	7
Timothy	4
White clover (Morsø)	3
English wild white clover	3
TOTAL	31

The seeds mixtures used are similar to the "Cockle Park" type of mixture and suffer from the same drawback of low production during the summer drought. The high value placed on smooth-stalked meadow grass (*Poa pratensis*) is due to its ability to withstand drought. Perennial ryegrass, which is sown widely in Denmark, is unproductive during this period. Meadow fescue is much more resistant to dry weather and, although it has the added advantage of being decidedly more winter hardy than perennial ryegrass, it is less frequently sown. It is doubtful if the Danes are making enough use of meadow fescue. English wild white clover is included in the long leys, as Morsø is short-lived. Many of the species sown in the "complex" seeds mixture never contribute to the sward at all, either because they are not suited to the environment or because the management of the ley tends to suppress them. No attempt is being made to use special mixtures for particular soils and climatic conditions.

All the species are bred at private breeding stations for high dry matter and high seed yields. The State trials, which compare all the new strains, also take careful note of these qualities. Emphasis is placed on them because the Danish farmer has been interested in leys primarily for hay and for seed production—an important export industry. The Danes have no commercial stocks of the pasture strains of grasses.

Grazing begins in May and ends in late September when all the cattle are brought inside for the winter. Drought during the early summer seriously curtails pasture growth. During the exceptionally dry spring and summer of 1947, for example, the pastures produced very little keep. A few farmers had mustard, lucerne, lupins, fodder beet and silage for their stock, but the majority had no provision for the "summer gap" in pasture production. Consequently many cattle were slaughtered.

Reclamation Denmark has to import all her coal, so that peat is used extensively as fuel. It is cut from an area in Zealand where the vegetation is dominated by silver birch and scrub. Peat is also obtained in large quantities from the moors of Northern Jutland. The dominant species on these moors are heather (*Calluna vulgaris* and *Erica tetralix*), and bogmoss (*Sphagnum cymbifolium*). The peat is removed from the surface to a depth of two feet and is then stacked to dry. After sieving it is transported to a factory, where it is compressed into small blocks.

In Zealand the area is regrassed after the removal of the peat. Lime, superphosphate and potash are applied, and a grazing mixture similar to that already quoted is sown. The problem of reclamation on the moors is different, since the land has to be drained and the heather burnt before cultivation. Two years later the soil is cultivated with rototiller, heavy discs and rollers. The plough is not used because the peat is too soft and spongy. The tractors and implements have special wide wheels so that they do not easily sink into the soil. The grazing mixture is in this case usually sown in May *without* a cover crop. A light hay crop is taken in the seeding year. After grazing for eight years the ley is ploughed and two successive potato crops are grown. It is then regrassed as before. The dominant species in the pasture are smooth-stalked meadow grass (*Poa pratensis*), bent (*Agrostis* sp.), and white clover.

Marshes along the west coast of Jutland and the shallow fjords of Zealand have also been reclaimed. Here open ditches drain into main outlets in the dyke wall, where there are either sluice gates or pumping stations. The *p*H of the soil is low. Heavy dressings of marl, together with phosphate and potash, are given before cropping. A rotation of the type corn-roots-corn-long ley is employed. The sown pastures tend to deteriorate, with tussock grass (*Deschampsia caespitosa*), meadow foxtail (*Alopecurus geniculatus*), and dogstail (*Cynosurus cristatus*) becoming dominant.

In all this reclamation work little investigation has been carried out to find the most suitable types of grasses and clovers. Trials laid down at the reclamation centres comparing grasses are cut three or four times a year. The strain with the highest total yield of dry matter is considered the best, irrespective of its leafiness, growth curve or nutritive value.

HIGH QUALITY KALE SILAGE-MAKING

P. G. Swann, N.D.A.

National Agricultural Advisory Service, South-West Province

ON a hill farm, known as Eastern Farm, Bishops Cannings, the property of Messrs. J. Horton and Sons and managed by Mr. Alan Smith, the problems of cheap kale silage production have largely been overcome after experience gained last year in the growing, cutting, and ensiling of 7 acres of kale.

The marrowstem kale grown in this instance was drilled as a first crop from an old, worn-out, permanent pasture field. The only cultivations carried out before drilling were three disc harrowings and a heavy rolling, and the kale was drilled at the rate of 8-9 lb. per acre, in rows spaced 21 inches apart.

Earlier, this particular field was found on analysis to be deficient in potash, and, prior to drilling, 1 cwt. muriate of potash and 1½ cwt. nitrogen per acre were broadcast on the kale seedbed. The actual sowing took place in the third week in April and the kale, germinating quickly, was not thinned out; the only cultivation after drilling was one inter-row scuffling.

The crop was not originally intended for silage, but its lush growth during the second week in October presented a problem as to the best way of conserving it for winter keep. The following procedure was adopted

for cutting, carting, chopping, and ensiling. The initial cutting out of the headland in the field was made with a mower, and the difficulty experienced in picking up the crop from the two or three swaths cut amply illustrated the need for a more efficient method of cutting and picking up. After the crop from the three full swaths had been cleared, a standard trailer-type 7-ft. cut binder was used behind a tractor on spade lugs. The binder cut and tied only one row of kale at a time. The cutting of two or more rows was tried, but was found not to be so efficient a time-saver as was expected.

The kale, cut and tied into sheaves, was then picked up and loaded on to low-loading trailers and carried straight to a high-capacity cutter-blower. The cutter-blower mechanism only of an American-type forage harvester, powered through the p.t.o. of a medium horse-powered crawler tractor, was used and found to be very effective. The average capacity of this cutter-blower, without working to straining point, was approximately one ton of kale in sheaf every six or seven minutes.

The chopped material was made into a clamp roughly 20 yards long by 6 yards wide, and the cutter-blower behind the crawler tractor was easily manœuvrable up and down the length of the clamp, thus ensuring an even spread of chopped material. This spreading of the kale in layers along the clamp facilitated the warming-up of the mass.

The kale crop, from various weighing experiments in sheaf, was estimated as giving a yield of 30-35 tons of green material per acre.

The working unit was made up of three trailers and two tractors in addition to the cutter-blower and crawler tractor and, with a total labour force of three men and one boy, ensiled daily 45-50 tons of kale.

The following points of maintenance on the binder are worthy of note :

(1) that the knife had to be lubricated fairly frequently ;

(2) that the bottom and elevator canvasses required attention at regular periods, i.e., tightening up or otherwise, depending upon the weather and moisture on the crop at the time of cutting. The cutter-blower mechanism also required regular and constant grease and oil maintenance, as the wet kale, working at high pressure, was apt to force grease from the bearings.

In the first instance the chopped material, when spread to a depth of 18 inches over the clamp site, was allowed two days to heat, and the next layers applied were found also in time to warm up as desired.

Analysis of the material in the clamp showed a crude protein content of 20.8 and a starch equivalent of 55 in the dry matter. The moisture percentage was 87, and the fermentation was typical of well-made silage with a remarkably high protein content. This material was fed at the rate of 50 lb. per day to each milking cow, in addition to a maintenance ration of 14 lb. of hay, this being suitable for maintenance and production of 1½ gallons. For cows yielding over 1½ gallons, the balance was made up with a mixture of crushed oats and dairy nuts.

No difficulties were experienced in feeding this material when the cows were first turned on to it, and an increase in yield and betterment in the quality of milk were noted and persisted.

MAN, POTATOES, AND THE DEVIL

E. C. LARGE

National Agricultural Advisory Service, Eastern Province

FOR at least a thousand years before the discovery of the New World the Indians of South America were very familiar with potatoes. They found a number of species growing wild in the uplands of the Andes, at 8,000 to 10,000 feet above the level of the Pacific Ocean. As time went on they selected and cultivated the kinds which they found best for food, and by exposing tubers to frost, treading the soft mush, and leaving it in the wind to dry, they also made the first dehydrated potato product, which now and for many centuries past has been known as *chuño*. They carried this food with them for sustenance on their wanderings, and in their art and imagination the very shapes of potato tubers became symbolic of human life. Their potato pottery of the Proto-Chimu period in Peru, perhaps about 1000 A.D., signified not only human food and human fecundity, but cruelty, nameless terrors of the forests, and "man's inhumanity to man". With the rise of the Inca civilization, the strange powers for good and evil which the Indians saw in potato tubers were beneficial to the tribesfolk. They made great and good use of potatoes. They brought them down from the mountains by llama transport to trade with the tribes of the coastal plains for maize, fruit and beautifully woven cloths. They built huge potato stores, to absorb gluts in the form of the dry *chuño*, and to supply the needs, in times of scarcity, of every man, woman and child in the vast Inca state. They enjoyed a mixed dietary of potatoes, llama and guinea-pig meat, fruit and maize ; and while this mixed dietary persisted all was well. Then came the Spaniards. The high social organization of the Incas was overthrown almost overnight, and those Indians who were enslaved and set to work in the mines suffered the potato evil. The Spaniards discovered that potatoes alone were just sufficient to keep slaves alive . . .

That is a little of the story that Dr. Salaman has to tell in the opening chapters of his momentous book.* With a great wealth of documentation and close historical research, he traces the history of the potato from antiquity in South America to its comparatively recent introduction into Europe, and thence through its period of trial and adoption, up to the present time, in each of the four quarters of the British Isles : England, Ireland, Scotland, and Wales. He also records the history of the potato in St. Helena, Jersey, and Tristan da Cunha. The book runs to nearly a third of a million words. There are over a hundred fine illustrations, as well as maps, appendices, statistical tables, and a most interesting additional chapter by W. G. Burton on modern industrial uses of the potato—none of them more ingenious than the old Indian *chuño*. The book is long and at times almost as digressive as history itself; it is a source-book of information for students and statesmen ; it contains new material for many a good school lesson in vital history and geography ; throughout its pages there is much of practical interest to farmers, especially on methods of cultivation, old and new ; but above all the book makes good reading. It is written by one of the world's leading scientific workers on the potato, who began life as a doctor of medicine and has never lost the doctor's realistic view of humanity. There is also something of Faust about it all. Underlying the whole writing of the book, and giving life to it, is a deep concern with eternal problems of good and evil. It is a doctor's vision of Man, Potatoes and the Devil.

---

* REDCLIFFE N. SALAMAN. *The History and Social Influence of the Potato.* Cambridge University Press (1949). 50s.

The story goes on. At some time in the latter half of the sixteenth century—before 1570, on evidence that Dr. Salaman has himself unearthed—potato tubers, with all their supposed latent powers for good and for evil, were brought to Europe by the Spaniards. It was a fateful event, and Dr. Salaman devotes the whole space of many a lesser book to brushing aside the shrouds of legend and error in which the whole matter has so long been wrapped, and exposing the true links between potato cultivation in the Old World and the New. We find here the earliest descriptions and drawings of the potato in European Herbals—with much about the character and veracity of herbalists. We find critical examinations of the old records in the light of recent explorations in South America, in attempts to determine which of the many South American species were in fact the parents of the potato with which we are familiar, and from what part of the Andes they must have come. We lose all faith in the old school-book story that Sir Walter Raleigh brought our potatoes from Virginia, for in truth he never went to Virginia, and would not have found any potatoes there if he had done so; but we gain an entirely new and true conception of the wealth of potato species and varieties growing in the Andes, many of them still awaiting adaptation to our western needs; and we find ourselves linked through the potato in a new and surprising kinship with the original peoples of South America. We also learn, again to our surprise perhaps, that the first real use made of the potato by western man was for ships' stores, and that chiefly as a cure for scurvy, for which purpose it was remarkably effective, owing, as we should say nowadays, to its content of vitamin C.

About the time of the Spanish Armada, and as likely as not by one of the Spanish ships dispersed by the storm and wrecked on the Irish coast, the potato reached Ireland. There on the rich bog lands, favoured by a moist and temperate climate, spared the worst ravages of virus disease by the paucity of greenflies, the potato found a new home. It came to a people whose tribal chieftains had been expropriated, and whose social system had broken down under the influence of Tudor feudalism, even as the Inca civilization had fallen at the hands of Spain. To these people the Devil proffered his gift of a new and prolific food plant, easy to grow on the smallest plot of land, demanding no co-operative effort and no real art of agriculture for its utilization, easy to cook, and containing just enough of minerals and protein, as well as of carbohydrates, to be almost a complete food when eaten in sufficient quantity. The gift was all too readily accepted. Chapter by chapter, through the seventeenth, eighteenth and nineteenth centuries, Dr. Salaman traces the result. The Irish multiplied but lived in hovels with their pigs. Becoming utterly dependent upon their potato plots, they were exploited for rent by alien landlords, levied for tithes by the church, pillaged and overrun by a hungry soldiery, and left without will or power to manage their own affairs. Then, in 1845, the Devil laughed. His gift rotted in the hands of its recipients. Blight, *Phytophthora infestans*, call it what you will, laid waste the potato crops. Gaunt and pestilential famine decimated the Irish people and left rents in the fabric of society that have not closed to this day.

In England the adoption of the potato was slower; it has never become more than an important *part* of a mixed dietary, and a certain stubborn refusal by the English working class to accept admixture of potato in their staple wheaten bread appears to have done more than anything else to save England from any really catastrophic potato disaster. But in the Highlands of Scotland there was tragedy again. After Culloden, in 1746, the Highland chieftains and landowners, divested of their former judicial powers, turned to sheep-ranging on a vast scale, and drove out the clansmen from their holdings

in the glens, to live as crofters and cottars on small plots of boulder-strewn land by the sea ; there to accept the gift of the potato, with a little fish, for the bare maintenance of life, and to be exploited and wrung dry for rent of once valueless land, where a more noble demand, for fair shares of meat and of grain, would have enforced a better deal and saved the Highlands themselves, which were soon to sink into mere hunting and fishing preserves.

"Who sups with the Devil needs a long spoon." That is the moral of Dr. Salaman's book. Potatoes, as part of a mixed dietary, are excellent fare. We could eat more of them than we do in England today, with advantage alike to our national stamina, our agriculture, and our dollar reserves. But whenever too much reliance is put on potatoes alone, either on the farm, or as food for a people, the result is a cumulative lowering of the standard of living and of agricultural practice, often ending in disaster. Potatoes are no longer too easily grown. We stand in no danger of demoralization on that score. The modern mass production of potatoes is about the most laborious of all work on the farm. The modern devil of potatoes is that they come of a vulnerable plant, and we cannot rely on their giving a yield high enough even to cover their bare cost of production unless we treat their cultivation with the utmost watchfulness and care.

Sense and Science are the long spoons we need before we dare trust to potatoes for supper ; sense in such matters as not taking potatoes too often on good potato land, lest we spoil it with eelworm ; in keeping out the Colorado beetle from across the Channel ; and in planting good certified seed, and not stuff that is a little cheaper but may be full of virus disease. Science we need in the form of long-term, sustained and adequate investigation, to improve our potato varieties, to put to use all the newly discovered solanaceous treasure of South America, to rid our seed still further of virus diseases, to find means of combating eelworm, to reduce storage waste, and perhaps at long last to fulfil the oft-repeated promise of Blight-resistant varieties.

APPLE-PACKING

F. C. Penney

Manager, Kirdford Growers, Ltd.

ON a visit to America last autumn I was able to visit a large number of packing houses in California, Oregon, Washington and British Columbia and discuss common problems with growers. Apple-packing in the Pacific North-West is still carried on in the conventional manner in standard, non-returnable, diagonally-packed, wooden apple boxes. There are signs, however, that America is entering a complete self-service era in the retail trade as far as foodstuffs are concerned. This may very well mean that the bulk package will soon be out of date and replaced by a consumer package of from 3 to 10 lb. Experiments have been carried out with all kinds of packages and packaging, from string bags to transparent wrapping, but the perfect apple package has yet to be found.

Better Packaging Consumer packaging is unsuited to the normal packing house, which is laid out specifically to handle large numbers of a single-sized bulk package, and is a nightmare to the packing-house manager, who seldom has any grader capacity to spare. Where large numbers of consumer packages are filled it has at present to be a separate operation in a separate building, the sorted fruit coming from the appropriate bins on the graders.

New machinery, however, is now being made that will pre-package apples into transparent film bags holding 4, 5 or 6 lb., and it is quite possible that one girl will be able to pack the equivalent of 800 bushels a day. The film bags will then be packed into a carton. To anybody who has fiddled with small cardboard divided containers (which never seem to be the right size), it sounds an attractive proposition. Apples look nice even when "jumble" packed in film bags, and if the cartons are handled properly the apples should travel all right. I think American apples might stand up to it, but it is doubtful if our own, rather softer, varieties would do so ; although surely in time it should be possible to get perishable products handled properly here.

Apart, then, from completely new methods and machines for packaging, which are as yet of the future, there is nothing new in principle in the present up-to-date American packing-house, though naturally great improvements have been made in detail in all their various handling machinery. The only real breakaway from the past is found in those few new houses that have adopted the fork-lift truck, and have "palletized" their whole operations. This really does produce amazing results in the saving of man-power, and anybody building new packing-houses or stores would be very foolish not to make them adaptable to a pallet system. At present the price of pallets—up to £4 each in this country, as against 15s. in America—makes it a rather hopeless proposition for our industry ; but doubtless this position will change in time.

Successful experiments have been carried out with disposable pallets made of fibre-board, and in time fruit may be handled entirely on pallets from the trees to the retailer's shop. Metal or wooden pallets would be used until the fruit is packed, then disposable pallets until it reaches its final destination.

Although they have been used for a number of years in the citrus industry, mechanized dumpers are just beginning to appear in the bigger apple packing-houses. I think they handle the fruit very carefully and I do not question the claims that they increase grader output by over 10 per cent. It is likely that they will come into common use, particularly as they fit in extremely well with the use of pallets. The combination again gives a great saving in man-power. One man can feed two big graders, including getting the apples from the reception shed. Fairly large outputs are required, however, to justify the capital cost of such equipment—250,000 bushels and upwards.

The only new package which took my eye was the moulded egg-carton type adapted for apples. This is constructed to take the normal apple counts of the diagonal box-pack, and I believe would be an ideal box for us to use for dessert apples. We are trying to arrange for it to be manufactured in this country so that it can be given a trial this season.

A good many sheds are now equipped with overhead hanging conveyors for empties, and all users say they are most efficient and practical.

Growing and Packing Costs Packing costs in the Pacific North-West have not increased in quite the same proportion as growing costs, but they still are very substantially higher than pre-war costs. The following gives an idea of the present position :

Box	$.3000	
Lids	.0440	
Pads	.0200	
Wraps and liners	.0700	.4340
Box-making labour		.0250
Labour		.1606
Overheads		.3700
Selling		.1000
Storage		.2000
		$1.2896

Growing costs for the 1948 season have been estimated at $1.70, of which approximately half is for labour. This gives a cost of practically $3 for the fruit packed ready for shipment. Refrigerated rail charges to eastern markets are $1.25 per box, so that a bushel box landed in, say, New York carries a total cost of $4.25.

The growing cost of $1.70 shown above was an estimate given me for the 1948 crop (a short one). No detailed costs for 1948 were available at that time, but British growers will be interested in the following Table showing how the growing costs of their opposite numbers have increased between 1940 and 1947.

Cost of Producing Washington Apples per acre—Yakima-Wenatchee Districts

(Compiled by Washington State College, Bulletin No. 493)

	1940	1947
	$	$
Pruning	4.91	44.25
Brush removal	1.16	7.23
Fertilizer	9.96	40.98
Applying fertilizer	.72	5.85
Cultivating and ditching	1.88	6.42
Irrigating	6.65	26.41
Spray materials	33.78	86.36
Applying spray	27.14	44.84
Thinning	18.05	53.68
Propping	2.45	10.07
Cleaning up	.29	5.79
Repairs	18.77	55.92
Gas and oil	4.62	12.99
Water costs	3.32	6.56
Taxes	4.20	8.60
Interest	17.00	80.10
Depreciation	9.00	35.95
Picking	35.63	90.33
Hauling and scattering boxes	10.10	7.76
Hauling fruit	7.44	30.46
Miscellaneous	10.34	94.74
	$227.41	**$755.29**

Cost per Bushel Box

Production cost per box	.556*	1.42†
Cost of packing, storage, marketing	.64	1.29
Average cost per box f.o.b. cars, Yakima-Wenatchee	$1.196	$2.71

* average per acre yield 1940—409 boxes.
† average per acre yield 1947—559 boxes.

No comparative figures of growing costs have as yet been compiled in this country. My guess is that they would work out rather lower per acre—about £125-150—and rather higher per box—about 10s. 6d.—due to the smaller average production per acre in our climate.

Packing costs are more difficult to compare. Our pre-war costs for packing and storage were 3s. per box, and our 1948 cost was 4s. 1d. The latter figure includes non-recurring items of 5d., e.g., for initial depreciations. But in this case we cannot compare like with like, as no proper box packing is possible nowadays. If it were, the cost of packing and storage might work out around 6s. 8d. per box. The only conclusion I can draw from these figures is that while our growing efficiency is the equal of the Pacific North-West, our packing efficiency still lags behind. This is not to be wondered at, since, owing to the war, the equipment of our packing-houses is ten years out of date.

Packing-house Labour If, however, packing-house outputs of half a million boxes and upwards are necessary to achieve comparative efficiency, then it is doubtful if we are in a position to compete. In America there is a large floating population of packing-house labour that follows the crops from South to North, and this labour can be used most of the year. The rest of the labour staff consists of local men and women. There is a tradition built up of turning out to help with the fruit crops on which so much local prosperity stands. While we have no floating population of professional packers to help us out, I do think we could build up a body of people who perhaps do not normally go out to work and who might enjoy turning out for our peak periods. But what to do in the off-season with the rather large permanent staffs that will be required for the big packing-house is a very knotty problem indeed, and one that may quite well mean that the very large, central packing-house is unsuited to this country.

Producer Co-operatives Regarding producer co-operatives packing and marketing concerns on the Pacific Coast, it is difficult to imagine the growers' plight had they not been so successful. They have been of tremendous benefit in protecting growers from excessive packing charges and in ensuring that growers get a fair deal in selling. They have had their ups and downs but are now securely established. They have grown from the bottom up, adapting themselves to their local growers and conditions. Their problems and ours are all the same and all different. There is no one set of rules applicable everywhere or any easy path to success; each co-operative group has got to meet their problems and solve them as they go along to suit their own particular conditions. I feel sure that there is a big future for producer co-operatives in this country, and that acting together they can and will do as good a job for growers here as has been done by their opposite numbers abroad.

THE GLASSHOUSE BOILER

Contributed by the MINISTRY OF FUEL AND POWER

ALTHOUGH summer is still with us, farmers and glasshouse growers are no doubt already thinking about their heating plant and fuel supplies for the coming winter. Everyone is eager to obtain maximum results at the lowest possible cost, but it is not generally recognized how often this is frustrated by failure to give proper attention to a few simple points.

To help the grower in this respect, let us begin by asking two questions : (1) Have you examined your boiler plant while it has been out of use ? (2) Are you satisfied that you are getting full value out of the fuel you are burning ?

The two outstanding problems arising from the present fuel position which cause most concern to consumers are the comparatively high cost of fuel in relation to other charges, and the increasing difficulty in obtaining the most satisfactory grade of fuel. The latter alone can increase the fuel bill. Everything possible is being done to improve the position in these respects, but there is no universal remedy. This article, however, indicates some of the ways in which the cost of heating may be reduced without substantially increasing other expenses. More or better fuel cannot always be authorized, but the Horticulture Officers of the National Agricultural Advisory Service, or the Ministry of Fuel and Power, can advise you how to improve the efficiency of heating plant so as to obtain more heat in the right places for the same money—or the same heat for less money.

Even the best equipment cannot continue indefinitely to give maximum service without regular overhaul ; without it, the efficiency of the plant inevitably declines, major faults develop and ultimately there is a complete breakdown—usually at the most inconvenient time. This is as true of heating plant as of every other kind of machinery, and the obvious time for overhaul is during the summer months when the plant is not in use.

The total quantity of fuel of all types consumed by the agricultural industry is estimated to amount to some 1,500,000 tons per annum. Some of this is liquid fuel, used in internal combustion or diesel engines for threshing and ploughing, and some is solid fuel used in drying kilns ; but about 1,000,000 tons of solid fuel a year are used to fire boilers, mainly of the sectional or tubular types, although Lancashire boilers are in use in some places and locomotive-type boilers are doing general duty on many farms.

If the efficiency of all these boilers could be raised by even 10 per cent, 100,000 tons of fuel per annum would be saved for other purposes—a very useful economy at the present time and (what is probably of greater personal interest to growers) the fuel bill would be reduced by 10 per cent. This is a very modest estimate of the saving which could be achieved merely by giving proper attention to the maintenance of the heating plant.

Simple Overhaul As soon as possible after the end of the heating season a few simple measures should be undertaken to prevent or arrest deterioration, which is more liable to occur while the plant is out of use. If these precautions have not already been taken, no further time should be lost. These are the steps to be taken :

1. Completely withdraw all clinker and partly burnt fuel.
2. Empty the ash-pit.
3. Clean the smoke-tubes and chimney to remove all soot and grit.

Failure to attend to these points will inevitably result in the formation of corrosive acids by the chemical combination of the sulphur in the fuel residue and in the ashes with moisture in the air. Such acids will eat through the pipes, firebars and ash-pan.

Having thoroughly cleaned the fire side of the boiler, leave all the doors and dampers wide open to promote the free circulation of air, which will

prevent condensation of moisture from the atmosphere and thereby help to prevent the formation of corrosive acids.

The water should not be drained from a circulation system unless essential for the purpose of repair or occasionally for clearing the boiler of any accumulated sludge. The addition of fresh water should be limited to "topping up," since, particularly in hard-water districts, all fresh water added causes an increased deposit of scale on metal surfaces, which, by acting as an unwanted insulator, retards heating and consumes more fuel.

Finally, lubricate all moving parts, such as door hinges and damper controls, and see that they move freely; paint or whitewash all exposed surfaces as a protective measure and cover all machined surfaces with grease to prevent rust.

Having halted deterioration by the foregoing means, a critical examination of all components is next desirable for the purpose of ascertaining damage done during the previous heating season as a preliminary to carrying out necessary repairs. The following are points which need special attention:

1. Replace any broken or warped firebars. The gap between bars is properly proportioned by the manufacturers to allow air for combustion to pass through the fire-bed while preventing partly-burnt fuel from falling into the ash-pan. Faulty bars will increase the width of this gap and cause loss of fuel, too much air where it is not wanted and, in consequence, waste of heat.
2. Renew any lagging which has been damaged. Lagging is put on the boiler and pipes to conserve heat and to concentrate it where it can be used. Unlagged surfaces therefore waste fuel.
3. Seal any leaks at joints, including the grouting round the base of the boiler All air for combustion must be under damper control. Even leaks in jointing on the chimney side of the boiler are harmful because they allow cold air to enter the chimney and thereby reduce the draught. All joints and brickwork can be tested with a lighted candle while the boiler is in operation. Where there is a faulty joint the flame of the candle will be drawn inwards.
4. See that the furnace doors fit snugly and that the refractory lining of the door is undamaged. A badly-fitting door will admit too much air, and damaged linings will cause the door to warp through overheating.
5. Examine all boiler fittings to make sure they are reliable. Check the response of the primary damper and the chimney damper. Make sure the safety valve (if fitted) is seating properly and is loaded to the correct pressure. See also that the thermometer is in working order and does not need replacing.
6. If automatic firing is used, whether for solid or liquid fuel, the firing equipment should be overhauled.
7. Examine all pumps, valves, air releases, etc. on the heating system to make sure that they are in proper working order.

When you are satisfied that the heating system is in good condition clean out the boiler-house and give it a coat of whitewash. Nothing fosters neglect more than dirt and untidiness. Even when you have restored the plant to proper working condition it is still necessary to consider its operation, for all that you have gained from careful maintenance can easily be lost if the plant is not operated correctly.

The Ministry of Fuel and Power issues a number of helpful publications which can be obtained free of charge on application to its Regional Offices. Bulletin No. 46, *How Glasshouse Growers can save Fuel*, is particularly recommended. Another useful pamphlet, *The Stoker's Manual*, can be bought for 6d. (8d. by post) from H.M. Stationery Office and gives much useful information designed to enable the stoker to obtain the best results from the plant.

Finally, if there is any problem in relation to plant maintenance or operation not covered in the foregoing brief notes or in the Ministry's official publications, a note to the N.A.A.S. Horticulture Officer or to the

Fuel Engineer at the nearest Regional Office of the Ministry of Fuel and Power will bring all possible technical assistance to ensure that the maximum results at least cost are obtained from the grower's heating equipment.

HOARY PEPPERWORT IN HERTFORDSHIRE

H. W. GARDNER

Institute of Agriculture, St. Albans

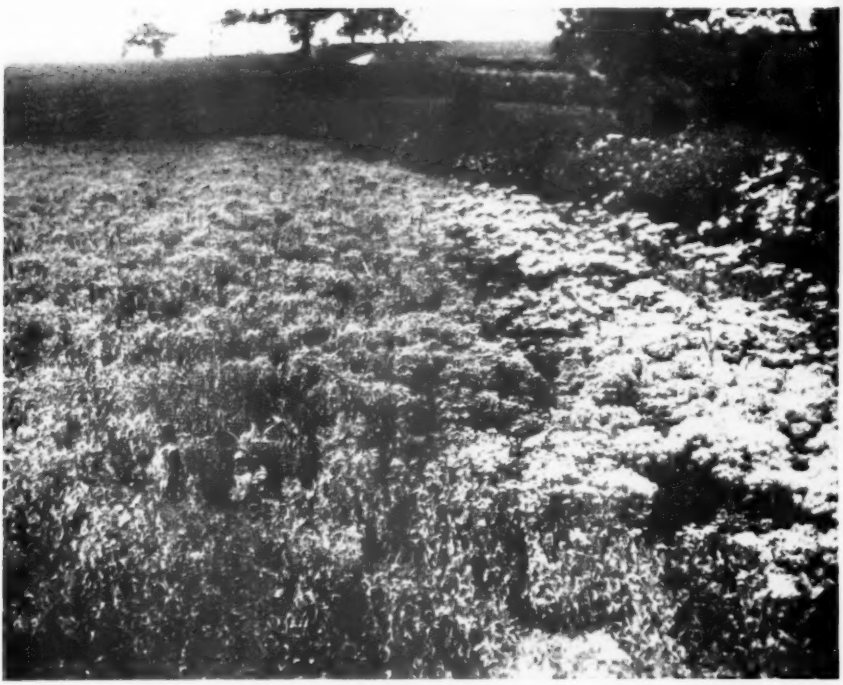
HOARY pepperwort has been a serious weed in Hertfordshire for many years. Publicity was first given to it at the County Show twenty-five years ago, and it has been featured, almost *ad nauseam*, at nearly every show since that time. It was hoped that by this continuous publicity the farmer would become familiar with the weed and dig it out before it got a hold; the rapid spread of its underground root system soon makes forking out impossible. Numerous embryo infestations have been dealt with in this simple way.

A thorough survey of the distribution of pepperwort in Hertfordshire has never been carried out, but it is common from the south-west border near Rickmansworth up to Letchworth in the North. It is not confined to any particular soil type—severe infestations are known on gravelly loams, sandy loams, chalky loams, loam with flints, and on medium-heavy types of boulder clay. Professor G. E. Blackman, in the April, 1949, number of this JOURNAL, has described it as one of the worst pests over considerable areas of heavy clay, particularly in the South-East of England. It is clear, therefore, that pepperwort can become a menace on all kinds of soil from light to heavy. The most seriously infested area in the whole of Hertfordshire is shown in Plate 1, a photograph taken in a field of winter wheat in April, 1948, when experiments were being started for the eradication of pepperwort. The soil in this case is of the glacial sand and gravel formation, and the field lies just north of the point where the Great North Road, A.1, crosses the River Lea, not far from Welwyn Garden City.

Another area where the infestation is almost as bad lies north-west of Hertford, on medium heavy soil of boulder clay. An impression of the density of the weed growth in this area can be obtained from Plate 2, which is reproduced from a photograph taken in 1926, shortly after the application of a sodium chlorate spray.

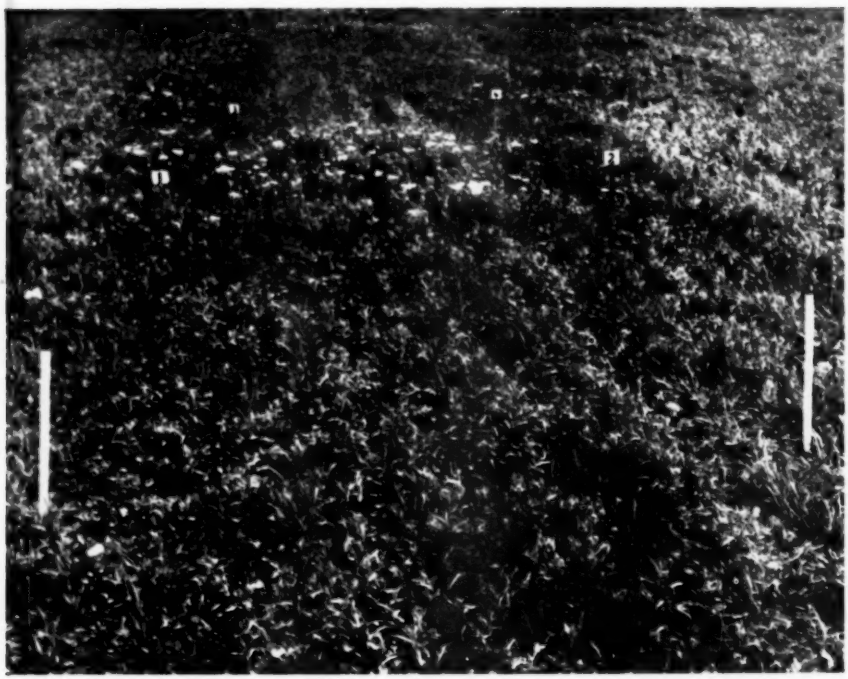
Pepperwort, besides being well established on many cultivated fields, is also prevalent on numerous rubbish dumps, some railway goods-yards, and in miles of hedgerows. Plate 3 shows a very vigorous growth on the verges of the main approach to Letchworth from the Great North Road. This was used as a tank depot during the war, has since become derelict, and is now a fruitful centre for the dissemination of the weed throughout the locality.

1 Infestation of winter wheat on glacial gravel near Welwyn Garden City (April, 1948).



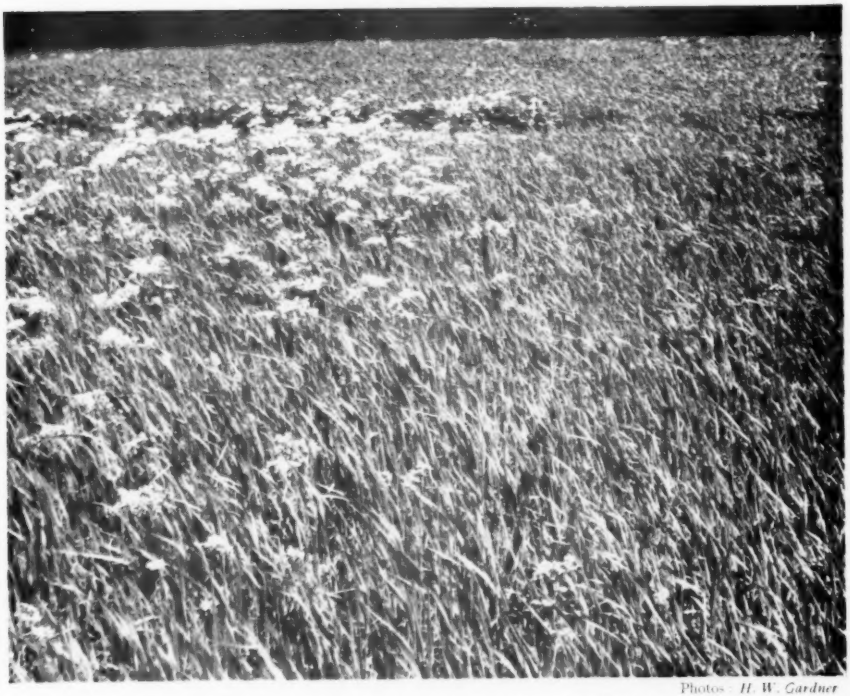
2. Heavy infestation on boulder clay near Hertford. Photograph taken in 1926 shortly after sodium chlorate solution had been applied on left half.

3. Pepperwort on a former war-time tank depot near Letchworth.



4. First trial with MCPA (3 lb. per acre) applied April, 1945, in powder form. The control plot is between the numbered laths, with the treated plot in the foreground.

5. The plot on the left was treated with MCPA (4 lb. per acre) as a spray. Photograph taken shortly after application in April, 1948.

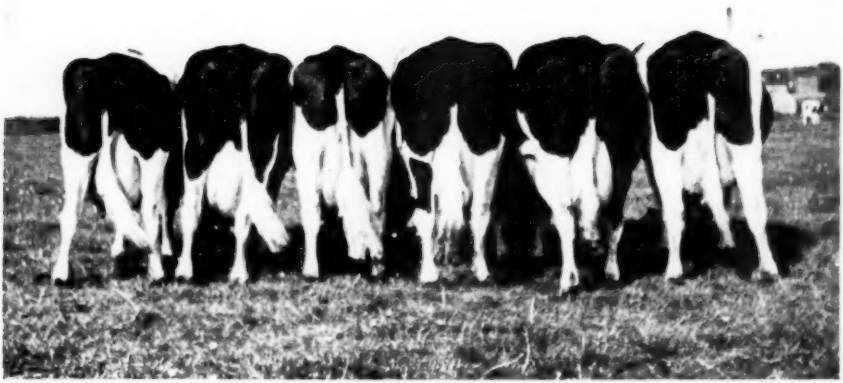


Photos—*H. W. Gardner*

6. In May, 1949, only a few plants survive on the right where MCPA (2 lb. per acre) had been applied as a powder a year before (= 2 cwt. of commercial powder per acre).

THE USE OF RECORDS IN BREEDING DAIRY CATTLE IN DENMARK AND THE NETHERLANDS (See pp. 255-259)

1. Red Danish cows.



2. Dutch Friesian cows.

Control By suitably planned rotations it is possible to keep the weed in check but extremely difficult to eradicate it (except from small areas as already mentioned). The rotation must include a large proportion of spring crops and, as was pointed out by Professor Blackman (*ib.*), satisfactory seedbeds for these are not easily prepared on heavy soils. On medium to light soils, however, by switching over mainly to spring crops (and the introduction of high-yielding spring varieties makes this possible for wheat as well as other cereals), the farmer should just be able to hold his own without the use of a weed-killer.

In the 1920s many experimenters tried the weed-killers in common use at that time—copper sulphate, iron sulphate, ammonium sulphate, etc.—in the hope of controlling pepperwort. In Hertfordshire, as in other counties, it was found that sprays made up from these materials severely checked the stems and so prevented a great deal of seeding, but, later, shoots grew from lower down and the total effect was disappointing. There can be little doubt, however, that such sprays, combined with the adoption of the right sort of rotation, would have been of considerable help in the battle against

the pest. But the scarcity of sprayers and the problem of the hundreds of gallons of water needed (as well as the economic conditions prevailing at that time) were too heavy handicaps against their use.

In 1925 Mr. C. E. Hudson and I started experiments with sodium chlorate as a weed-killer. At that time its possibilities had not been appreciated in this country and no cheap source of it was known. The first weed attacked, with very promising results, was the wild onion, and the following year it was also tried for cleaning bare fallows, for charlock and for pepperwort. These trials showed that eradication of pepperwort with chlorate was a possibility if persisted in over a number of years but, owing to its drastic effect on crops, was not a practicable method. All weed-killers are "selective" in the sense that different minimum amounts or concentrations are needed to kill different plants, but the range of "selectiveness" of sodium chlorate is not a convenient one for the eradication of weeds in farm crops : for example, 5 lb. per acre of sodium chlorate will kill charlock or ragwort, but even this small amount can do severe damage to cereals ; docks may be resistant to 80 lb. per acre.

Hormone Weed-killers In 1945 supplies of MCPA (then called CLC) were made available to County W.A.E.C.s for demonstration purposes, mainly on the control of charlock. After the main demonstrations had been begun in Hertfordshire, trials were also started on their use for pepperwort and buttercups. It was realized that as charlock and pepperwort were members of the same family, and as the hormone could be incorporated with a dry filler and applied with a fertilizer distributor, there was, at last, a good chance of opening a winning offensive against the pepperwort pest.

The trials in 1945 on two farms were very successful—perhaps encouraging is a better term, since with a weed like pepperwort observations over several years are necessary to measure the degree of success. Two plots at one centre are shown in Plate 4. The control is between the numbered laths, and in the foreground is the plot which was dressed with powder at the rate of 3 cwt. per acre (=3 lb. of the hormone) on April 11.

On the other farm approximately 100 per cent kill of pepperwort was obtained in the year of application with 3 gal. per acre (3 lb. of the hormone) of the commercial product diluted to 100 gal. and about 80 per cent with 3 cwt. of the powder form. In this case the farmer was so impressed with the results that he has since made it a regular practice to go round his fields with a supply of the powder, applying it wherever a plant could be found. He has now practically eradicated it from his farm.

Unfortunately, the observations planned for 1947 on the trials started in the previous year could not be carried out, and it was not until the spring of 1948 that another experiment was started. The site chosen was that shown in Plate 1, the field in that year carrying winter wheat. MCPA was applied at two different rates both in the two different forms, liquid and powder ; the plots were made large enough to be sub-divided with a view to repeating the dressings if necessary in the following year, and the treatments were replicated.

Detailed observations on these and other plots have been made and will be included in a subsequent article, but the very striking results obtained will be apparent from Plates 5 and 6. Plate 5 shows the suppression of the pepperwort by 4 gal. MCPA solution (4 lb. per acre of the hormone) soon after application in 1948. In the following year, 1949, barley was sown and, as would be expected from a spring crop, the general infestation was not so outstanding. This can be seen on the control plot on the right of Plate 6,

which shows the effect of 2 cwt. of the powder (=2 lb. per acre MCPA) *applied a year earlier*. A picture of this kind is an excellent corroboration of the conclusion tentatively reached in 1948 that a farmer, by adopting the policy of a sequence of spring crops plus annual treatment with a hormone dressing, could, in the course of three or four years, practically eliminate the weed. *Although the application of a powder is less efficient than a wet spray, yet, as Plate 6 illustrates, the powder can be extremely effective and is a method any farmer can adopt.* By persistent use of the hormone the few survivors from one year will be further reduced the following year.

Further experiments are in progress comparing MCPA and DCPA at different rates per acre and in wet and dry applications. There is, however, no necessity for any adviser to await the results of more trials. He can confidently go ahead urging the farmer to tackle the infested fields, on the heavy land adopting the policy advocated by Professor G. E. Blackman, and on medium and light soils that suggested above. County Agricultural Committees, in conjunction with Local Authorities, would also be justified in attacking the weed on waste places, refuse dumps, hedgerows and the numerous other centres acting as sources of reinfestation. Pepperwort has been on top for many years: it is full time it was suppressed, and the means are now available for doing so.

LANDOWNERS' COURSE IN ESTATE MANAGEMENT

THE HON. ANTHONY STRACHEY, M.A.
Central Landowners' Association, Somerset

A THREE-DAY refresher course in rural estate management was organized by the Central Landowners' Association at the Royal Agricultural College in April. Sixty-five members of the Association attended, and the course consisted of seven lectures, interspersed by visits to seven farms in Gloucestershire and Wiltshire to inspect buildings and systems of husbandry.

Four of the seven lectures dealt with the economics of rural landowning, as affected by taxation, rents and recent legislation. Two dealt with the problems of the maintenance and improvement of fixed equipment on the land, such as farm buildings and farm roads, and the last, given by the President of the Association, Major R. G. Proby, dealt with The Future of Private Landowning and some of the imponderables, political, economic, as well as agricultural, which inevitably impinge on this topic.

All parts of England and Wales were represented at Cirencester, and it quickly became obvious from the discussions after the lectures and the comments made on the farm visits that what is common sense in one part of the country may well be nonsense in another; a method of farm building suitable for Gloucestershire farming may be quite inapplicable to Cumberland;

a method of road-making that is the cheapest in Somerset might be the most expensive method in Hampshire ; the best solution to a problem of estate finance in one set of conditions might be quite impracticable in another. Thus one of the outstanding lessons of the course was that while technical knowledge of the requirements of modern farming is important to good estate management, there is a great danger in theories and generalizations not based on an equally sound knowledge of local conditions and traditional methods of dealing with local problems.

An added complexity in dealing with estate management policy in general terms is due to the diversity in size of estates and type of rural land tenure. The sixty-five landowners attending the course themselves represented holdings ranging from 5 to 50,000 acres. Some were farmer-owners ; some traditional estate owners whose land is managed on the landlord and tenant system, and on which timber production plays an important part in the estate economy ; some were both landlords and owner-occupiers in varying degrees of emphasis.

Economics of Land Ownership But dominating all the subjects discussed and overriding the diversity of local agricultural conditions and type of land tenure was the problem of economics. It was a thread running through all the lectures—the ability of the rural landowner to carry out all his duties and yet remain solvent. It was mentioned by the Chairman of the Association, Lt.-Col. W. R. Burrell, in his opening remarks and by the President in his final address. It constantly recurred during the farm visits, when guides were closely questioned about costs of construction and the labour-saving effect of alterations. Significantly the opening lecture was entitled "The Influence of Taxation on Landownership Policy" ; it was given by Mr. W. Walker Watson, an able accountant who has specialized in rural estate finance. But the subject loomed equally large in the next lecture entitled "Farm Rents and the Rate of Interest on Improvements"—a subject that was covered comprehensively by Mr. Charles Walmsley, author of the recent publication, *Rural Estate Management.*

But perhaps the most forceful example of how economics linked the outlook of all the speakers came in the opening remarks of Mr. N. Dean of the Cambridge University Estate Management Department in his lecture, "Farm Buildings—Their Design, Methods of Construction, Adaptation and Repair"—a subject on the face of it dealing more with construction than finance.

"Under existing conditions," he said, "with building costs at least five times those ruling in 1914, and agricultural rents in general not very much above 1914 levels, however much advice they receive landowners find great difficulty in carrying out repairs essential to prevent further deterioration, much less improve their buildings or provide new ones. We now have the ridiculous position of the cost of replacement of farm buildings considerably exceeding the freehold value of the farm. Under these circumstances it seems to me that the most useful advice which could be tendered to landowners and their professional advisers at the present time is 'How to get a quart out of a pint pot'—and I wish I knew the answer. In other words, the problem is one of economics ; and until agricultural rents are raised to figures more in keeping with present-day values, there seems to me little point in discussing model new homesteads."

Against such a background, Mr. Dean dealt with the best ways of repairing and reconditioning to increase efficiency at the lowest possible cost. As regards a farm building policy, in his view "the most useful thing that can

be done at the moment is to avoid expenditure on new buildings of a highly specialized character which cannot readily be adapted for other purposes should the system of farming change." Such adaptability, he believed, would be promoted by bearing in mind certain "master dimensions" for all buildings.

Of very considerable interest was Mr. C. Walmsley's discussion of the theory and practice of various conceptions of rent, and here he stressed the importance of the owner-occupier maintaining in both his mind and his accounts a true distinction between his capacity as owner and his capacity as occupier, if he wished his records to be other than "incomplete and misleading".

Concerning "fair rents," he said: "How can one achieve a stable rent on a basis acceptable to the tenant and fair to the landlord? The ideal approach is certainly to look at each holding, not as it exists now, but as it should be, equipped so that a first-class tenant can obtain the maximum sustained productivity at the lowest cost. This approach involves carrying out an improvement survey to ascertain what is really needed . . ." Having gone into some detail about the improvement survey, Mr. Walmsley commented sadly: "Many land agents would agree with the principle of the improvement survey. Few indeed, at this particular time, could treat it as more than a counsel of perfection," for the reason that "a land agent's day is so fully occupied with the machinery of routine management and with picking his way through the jungle of recent legislation". None the less he strongly advocated such a survey where possible.

It was with this "jungle of recent legislation" that the next two lecturers dealt: Mr. F. G. Holland, solicitor and assistant secretary to the Association, in "The Town and Country Planning Act, 1947: The Land, the Act and Estate Finance," and Capt. E. H. Mostyn of the Agricultural Land Service, in "Some Aspects of the Agricultural Holdings Act, 1948". Mr. Holland pointed out that while the planning Act had, through the development charge, nationalized part of the financial resources of an estate, the agricultural development of an estate was largely unaffected, except that planning permission would be required. Capt. Mostyn was equally informative in helping his audience digest the effect of recent legislation on the traditional relationship of the landlord and tenant. While the tenant's position had been strengthened, his liabilities, both in regard to repairs and standard of farming, had been increased. Agreements were now made to be complied with by both parties.

The lecture on The Maintenance and Improvement of Farm Roads by Lt.-Col. H. A. Sawyer contained much useful and practical material, and the discussion that followed showed just what a burning question this subject is to many landowners. Space allows only a mention of the speaker's graphic rule-of-thumb for farm road economics—"Sufficient unto the strength is the expense thereof".

Farm Visits Farm visits included those to the Royal Agricultural College, under the guidance of Professor R. Boutflour, where detailed costings were given showing the financial results of the systems of dairy husbandry employed. As with the other farms, the emphasis was on milk production. The other six farms were visited under the guidance of Mr. N. E. B. Elgar, South-West Provincial Farm Buildings Advisory Officer. (It should be mentioned in passing that Mr. Dean had in his lecture exhorted both the industry and the professions to encourage specialization on farm buildings.) The yard-and-parlour system was much in prominence. Costs given for erection of new buildings on this system at two of the farms visited worked out at £40-£45 per cow, which compares favourably with new

cowhouses at present costing between £50 and £60 per cow. Other items of interest included: ingenious uses of scrap materials, methods of controlling feeding of yarded cattle (still in the experimental stage), buildings for grass and grain driers, and construction of labour-saving bull, cattle, and calf pens. While admiring the pioneering inventiveness of such milk producers as Major J. Lowsley-Williams of Manor Farm, Tetbury, Glos, visiting landowners were most interested in the capital outlay, the adaptability of buildings, and their likely length of service.

The members attending the course dispersed with much food for thought. It is clear that landowners have an essential part to play in the expansion of agriculture; their role, either as landlord or farmer-owner, is neither simple nor passive. The rural landowner has a multitude of calls on his time and pocket; his obligations to the State are heavy, and the technicalities of his business are complicated by legislation and State policy. But as the President of the C.L.A. reminded his listeners in his closing address, though much is expected of the landowner in local and public affairs, he must first of all strive to remain solvent if he is to be of use either to the community or to his dependants. So in the words of Voltaire, "'Cela est bien dit,' répondit Candide, 'mais il faut cultiver notre jardin'."

HOME-MADE POULTRY HOUSING

J. B. Thorburn
Bridport, Dorset

IT is possible that many general farmers are deterred from expanding poultry production by the high cost of poultry houses. Prices are now about five times as much as before the war, and this means a considerable capital expenditure to accommodate a fair-sized flock of hens.

Existing farm buildings can sometimes be used, but only to a limited extent if it is intended to run the birds on free range. A large flock of hens roaming the farmyard can be a nuisance, and the risk of disease is increased when the birds are concentrated on the same piece of ground year after year.

If good use is to be made of the natural food found on leys and stubbles and if hens are to contribute to the fertility of the land by their droppings, movable free range houses must be used. The manufacturers of poultry houses offer a wide choice, but home-made houses can be made for a fraction of current prices if, instead of buying new timber, alternative materials are used and there is a man about the place handy with carpenters' tools. Recent developments in poultry-keeping have shown that the hen is far less conventional about the kind of accommodation she requires than was once thought. Poultry do require dry, well-ventilated but draught-proof houses and sufficient room for each hen to roost comfortably. Given those essentials, the birds will thrive in a wide variety of housing conditions.

The house must be movable, which means that wheels or skids must be provided. Where a tractor is available for moving, skids are the more satisfactory, and they are cheaper because suitable wood can often be found on the farm.

Next comes the floor. Although a solid floor is ideal, one can be made of slats upon which the birds will roost, or it can be omitted altogether if perches are fitted. Wire netting fastened across the bottom of the house will safeguard the hens against foxes. Rats may be a nuisance but they seldom attack adult birds.

For proper comfort each hen requires nine inches of perch space or one square foot of slatted floor. It is advisable to give them as much space as possible, because overcrowding will reduce egg production. A slatted-floor house to hold 50 hens ought to be about 8 feet × 6 feet ; if perches are used, rather bigger.

The walls and roof of the house can be made of any material which is weatherproof. Hens do not need much head room. The old-fashioned poultry house was always made sufficiently high to enable a man to enter it for cleaning. Cleaning is always necessary, although with the slatted-floor, or no floor, type of house which is moved frequently on to fresh ground, it can be reduced to a minimum. For example : it is quite simple to make the roof detachable or to work on a slide. Alternatively, one of the side walls could be made detachable.

Timber for the framework cannot be bought new (except under licence), but it may be cut from a coppice or, more likely, obtained from disused equipment. The writer made some serviceable poultry houses out of old A.R.P. folding beds, and there are many other surplus wooden objects about these days. The framework may be covered with roofing felt or thatching straw as protection from the weather, wire netting being superimposed. Galvanized iron or aluminium alloy sheet are, of course, more durable but more expensive. When making the roof it is important to provide good and draught-free ventilation. During a long winter night hens, crowding together for warmth, consume a great deal of oxygen, and unless the air in the house is renewed frequently their health will suffer. They can endure very low temperatures, provided there are no draughts.

Orange crates make good nest-boxes. They are so good that they might almost have been designed for the purpose and, being cheap, they can be renewed frequently. It is advisable to fit them with a simple closure to prevent the hens from roosting in them at night.

Parts of old aeroplanes, pontoons and boats, old vans and even the bodies of derelict tramcars and railway carriages have been used for making poultry houses. With a little ingenuity and labour—at quiet times of the year or during bad weather—such material can be converted into useful, and not necessarily unattractive, housing equipment for the additional poultry the country needs so much.

FARMING AFFAIRS

Hill Farming Land Improvement Progress

Substantial progress is being made this year with the improvement of hill farms in England and Wales with the help of grants under the Hill Farming Act. These grants, which amount to one-half of the cost of the work done, are given to owners and occupiers of hill farms who are willing to carry out schemes approved by the Minister of Agriculture and Fisheries for the improvement of their land. Schemes may cover as many as twenty-three different kinds of improvements, e.g., the repair and modernization of existing farm houses, cottages and farm buildings and the building of new ones; work on roads, bridges and water and electricity supplies; the improvement of grazings, drainage and fencing; and the planting of shelter belts. They must be comprehensive—that is, they must include sufficient improvements to put the farm into a proper working condition.

By July 31, 1949, 123 schemes had been approved and were in operation, and 2,034 proposals for schemes were under consideration, making a total of 2,157 "live" schemes. 1,379 of the 2,034 proposals (about 64 per cent) had been approved in principle and were awaiting the preparation of formal schemes for approval. Work had actually been started on 761 schemes still awaiting formal approval.*

The 2,157 "live" schemes relate to 2,657 holdings, with a total area of about 864,000 acres, and represent about 17 per cent of the total number of hill sheep farms in the country. Although the total cost of the work under the schemes is at present estimated at about £2,393,000, it will probably prove to be considerably higher, principally because the preliminary proposals are often extended to cover more improvements by the time the scheme is formally approved. The main improvements are those to farm buildings (£475,000, or 20 per cent of the total), farm houses and cottages (£337,000—14 per cent), improvement of grazings by manuring, reseeding and laying down of permanent pasture (£360,000—15 per cent) and work on fencing (£229,000—10 per cent), roads and bridges (£162,000—7 per cent), water supplies (£98,000—4 per cent), electricity supplies (£91,000—4 per cent) and drainage (£106,000—4 per cent). Full details are given in the Table on p. 282.

The position at July 31 for England and Wales was as follows:

	England	Wales	Total
Schemes approved	37	86	123
Proposals approved in principle	379	1,000	1,379
Proposals under consideration	338	317	655
Total "Live" Schemes	754	1,403	2,157
"Live" Schemes			
Total	754	1,403	2,157
Estimated cost†	£1,090,000	£1,303,000	£2,393,000
Number of holdings covered	1,028	1,629	2,657
Total acreage of holdings	358,000	506,000	864,000
Percentage of hill farms covered	14	18	17
Number of schemes awaiting formal approval for which work has been authorized	296	465	761

*See also paragraph 5. †See also paragraph 3.

Improvement schemes, which usually include a large number of individual items of work, are carefully considered on the spot, in consultation with the promoters, by officers of the County Agricultural Executive Committees and of the Ministry's Agricultural Land Service to ensure that they are suited to the requirements of the farm. Schemes, which require the Minister's formal approval under the Act before grant can be paid, are also considered at Ministry headquarters to ensure that they are dealt with as uniformly as possible. This necessarily takes some time, but no urgent work need be held up because a scheme has not been formally approved. Authority to proceed with it can be given by the Land Commissioners on the understanding that grant will be paid only if the work is done satisfactorily and the improvement is later included in an approved scheme. Work has already been started under this arrangement on 761 (nearly 40 per cent) of the schemes not yet approved.

Proposals for schemes are first approved in principle on submission of a list of proposed improvements, so that promoters may know whether their schemes are likely to be eligible before going to any further trouble or expense in preparing them. When the proposals have been approved in principle, applicants are asked to submit the necessary documents for formal approval by the Minister. So that schemes may not be delayed until full technical details for all improvements are available, formal approval may be given on a general description of the work with a rough estimate of its cost; in that case the necessary detailed specifications, plans and estimates are sent to the County Agricultural Executive Committee later when the promoters are ready to begin the work. Any applicant who has difficulty in drawing up his scheme may obtain guidance from his County Committee or the Land Commissioner on the understanding that he takes full responsibility for the scheme.

Some promoters are still taking a considerable time to prepare their schemes for formal approval after they have been approved in principle. This may be because they are experiencing difficulty in getting estimates from contractors. While estimates given in schemes should be as close as possible to the actual cost of the work, the Ministry realizes that they will often be only a general indication of the probable cost and, provided the plans and specifications submitted later indicate that the reasonable cost of necessary work will be more than had been expected, grant will be paid on the actual cost, even though it is higher than the estimate given in the scheme. If, therefore, contractors' estimates are not readily available, promoters should not hold up their schemes but submit them with a general indication of cost. Payment for work done in advance of the formal approval of a scheme cannot be made until that approval has been obtained; it is therefore in the promoters' own interest to submit his scheme as soon as possible.

Although the funds available for the payment of improvement grant for the whole of the United Kingdom may be increased by a further £1,000,000 with the consent of the Treasury and the approval of Parliament, they are at present limited to £4,000,000. Well over one-half of this sum has now been earmarked for schemes already received, even allowing for the present figures probably being low. Intending applicants should therefore not delay submitting their proposals. Full details and forms of application may be obtained from the Agricultural Executive Committees in hill farming counties, the Ministry of Agriculture, Hill Farming Branch, 14–21 Chester Terrace, Regent's Park, London, N.W.1, or from the Ministry's Welsh Department, 17 Eastgate, Aberystwyth.

Hill Farming Land Improvement Schemes in England and Wales as at July 31, 1949

Analysis of Proposed Expenditure

	Estimated Cost	Percentage of Total
Farm buildings	£475,449	20
Farm houses	224,223	9
Farm cottages	113,140	5
Roads, bridges	161,881	7
Water supply	98,229	4
Electricity	91,313	4
Pens, dipping accommodation	43,154	2
Silos	2,265	‡
Fencing	229,024	10
Grids	495	‡
Drainage	105,725	4
Reclamation of wasteland	11,777	‡
Shelter belts	37,627	2
Liming	68,733	3
Manuring, reseeding, permanent pasture	359,911	15
Removal of bracken	24,316	1
Machinery	5,055	‡
Pest destruction	938	‡
Unspecified (costs supplied relate to a number of improvements and no reasonable apportionment can be made)	339,998	14
	£2,393,253	100

‡less than 1 per cent.

World Food and Agricultural Science

Sir John (now Lord) Boyd Orr was the first speaker at the International Congress on Population and World Resources in Relation to the Family (Cheltenham, August, 1948), the report of which has recently been published.* His subject was the world's food resources. He made two assumptions : that it is the duty of every Government to ensure the primary necessities of life for every family, and that we must regard all countries as having equal right to the primary necessities of food, clothing and housing—and by " housing " he meant not merely shelter but a house in a sanitary environment free from endemic disease. World population is increasing at the rate of 20,000,000 a year. By the end of the century it is likely to have increased from the present 2,000 million to about 3,000 million. " Can we stop the population of the world growing ? " While we talk of birth control, and migration, in Lord Boyd Orr's view the only way to get a static population is to raise the living standard of people and to spread education : then he hoped and believed there will happen all over the world what has happened in Western Europe—a fall in the birth-rate, and though the death-rate must fall too, we may hope to get a stable world population at whatever level is found to be most suitable.

Malthus (1798) affirmed that a stage would soon be reached when there was not sufficient food to feed the people of the world. It was therefore wrong, he suggested, to bring in measures for social amelioration, for preventing infant mortality and for keeping people healthy. They would only aggravate the problem. But Malthus did not forsee the great opening up of the western and southern hemispheres, which almost doubled the area of land capable of producing food, nor the advance of science. Today we cannot look forward to the discovery of any new land. All the land which can be easily brought into cultivation by existing methods has already

*H. K. Lewis. 10s. 6d.

been enlisted. During the second world war we added almost nothing, in spite of the great shortage of food. And all over the world much of the land is losing its fertility.

There are those who believe we cannot produce sufficient food to feed the World's people, but, said Lord Boyd Orr, they are not authorities on agricultural science. If the best cultivation, the best methods, the best seeds were used, it is possible that as much food as is being produced now could be produced on half the present acreage. In addition, lands which have become barren can be brought back into cultivation. In several parts of the world it has already been done by irrigation. " It is difficult to set limits to the amount of food which can be produced if we would apply science to food production with the same intensity that we apply science to destruction in war . . . The number of people we can feed and clothe and house is limited only by the amount of effort that Governments are prepared to devote to it."

It should be done, he said, not only for the benefit of the ill-clad, ill-fed people but for our own salvation. Malthus did not realize that people will not die quietly. People who are short of food, and especially people whose standard of living has come down, are not interested in anything else ; they are not interested in political ideologies, but will follow anyone who will promise them food. In conclusion, Lord Boyd Orr made a strong plea for national co-operation in a world plan.

National Pig Starter Food The surest way of rearing pigs successfully is to start them well and get them through suckling, weaning and the trying period onwards to 12 weeks without a check to their health and growth. If this is done, they are able to deal with coarser foods at an earlier age, and finish out with better carcasses some weeks earlier than they would otherwise do.

In the absence of appreciable quantities of milk by-products there is a real need for a good pig starter ration.

To meet this need, authority has been given for the supply of special feed—*National Pig Starter*. As such, it is naturally intended to be used as a " creep feed " as well as for feeding during the first 10 days or fortnight after weaning. It is made under licence and sold at a controlled price. Its composition is safeguarded both for the quantity of its ingredients and for their quality. As required by the young pig, the total content of protein is somewhat higher than that of National Pig Ration No. 1. The animal and vegetable proteins in it have been chosen for their suitability, and special attention has been given to the inclusion of the necessary minerals and vitamins. The new National Pig Starter ration is a complete food for the young pig. However, when the litter is not running out-of-doors, it will still be advisable to dose the young pigs with iron during the third week after birth, in order to prevent the development of anaemia (see Animal Health Leaflet No. 1).

When applying, in the usual manner, to the County Committee for the farrowing allowance of 9 cwt. of feedingstuffs, pig-keepers will be asked to indicate on the application form (obtainable from the Committee) whether the preference is for the allowance in the form of 3 cwt. of National Pig Starter and 6 cwt. of ordinary cereals and proteins *or* the whole 9 cwt. in ordinary cereal and protein coupons (in the usual proportions). The former alternative is the recommended course. The coupons will be issued by the Committee in the usual way.

Special feedingstuffs coupons have been prepared for the National Pig Starter, and these are available only for that food. They should be deposited with the pig-keeper's suppliers, as with other feedingstuffs coupons, within 15 days of the date of issue.

It is a good plan to get piglings interested in solid food very early in life. Their appetites can be, and always should be, stimulated. Food goes twice as far before weaning, compared with the amount needed for each pound of liveweight increase between weaning and slaughter. Well-suckled piglings have better appetites than those poorly suckled, as they are putting on weight more quickly.

Left to themselves, young pigs will begin to eat the food in the sow's trough. But coarse, wet foods are unsuitable for little pigs and are apt to chill them. Shivering and indigestion cause set-backs. Piglings learning to eat do best on dry feeds given at short and definite intervals. Creep feeding is essential; otherwise, the sow will eat the piglings' special food.

Creep feeding is simple and inexpensive to arrange. It just means keeping the sow away from the piglings' food. A small trough in a corner of the sty, fenced by a strong hurdle is sufficient. It is well worth the small trouble involved, and ought to be a routine practice on every farm rearing pigs.

National Pig Starter should be offered dry to the young pigs by the time they are three weeks old. Give them small amounts two or three times a day. At first the piglings are likely to nose about in the food, but later on they should eat well over a pound a day per head

Water is essential and should be freely available, but the piglings should be prevented from wallowing in it.

As soon as the young pigs are strong enough they should go out for an hour or two every day to root in the grass. If the weather is bad, a sod or some fresh soil should be placed in the pen each day from the third day after farrowing.

Grain Storage With more and more corn being ingathered by combine harvesters, the problem of grain storage on the farm becomes greater and more widespread. A new Growmore Leaflet (No. 102), *Combine Harvesting and Grain Storage*,* will, it is hoped, help considerably in this connection.

Four courses are open to farmers: storage in sacks, in heaps on the floor of buildings, in shallow bins not more than 4 feet deep, or in specially provided deep silos. The state of the buildings in which the grain is to be stored calls for special attention. The floors must be strong and impervious to moisture, the walls, also strong, should have a sound damp-proof course, and the roof should be watertight. Ventilation should be provided both near ground level and high up in the building.

Farmers with only a small acreage of corn for storage will find sacks stacked not more than four high, shallow bins, or even heaping the grain on the floor entirely satisfactory and cheap.

Shallow bins can be formed by using timber, concrete planks or slabs, bricks or corrugated metal sheets. If the floor is likely to become damp from ground moisture, either an impervious layer should be added to it, or a false floor, raised 3–4 inches, should be provided. If bins of this kind are at first-floor level, provision should be made for delivery by chute to the ground floor.

Deep bins or silos can be specially constructed in brick, concrete, or curved corrugated steel sheets; or prefabricated units may be bought from most concrete manufacturers. The choice between cylindrical and rectangular silos is not easy, but in general it is probably true that in first cost the cylindrical shape is slightly more attractive. Silos may be of any height up to 20 feet and diameter up to 14 feet, but, in silos of this size, there must

*Free and post free from the Ministry, 1 St. Andrew's Place, Regent's Park, N.W.1.

be some method of moving the grain by mechanical conveyor or by pneumatic elevators. Where the grain can be dried effectively before being stored, it is doubtful whether self-emptying bottoms to bins or silos are worth while on most farms, but some conveying system for filling and emptying is needed so that small pockets of grain tending to heat may be dealt with, by transfer of the grain from one bin to another.

If silos are placed in open-sided buildings, care should be taken to ensure that the walls of the silos will not absorb rain blown against them. It is an advantage if prefabricated concrete grain silos are of the " stave " type held in by stout wire ropes. This enables them to be dismantled and re-erected elsewhere without difficulty. A good arrangement for silos is to place them in a double line, so that they discharge by gravity into a central trench from which the grain may be conveyed mechanically or by pneumatic methods.

With either deep or shallow bins it is essential to have one extra bin so that, in case of need, grain can be moved at will from bin to bin. In deciding the number and capacity of bins required, the following figures of volume per ton will be useful.

Wheat	45 cu. feet per ton
Barley	50 cu. ,, ,, ,,
Oats	70–80 cu. ,, ,, ,,

The Farm Buildings Advisory Officer is ready to help with any problems arising from the need to convert buildings or construct new ones.

Guard specially against attacks by rats and mice. They will not be slow to take full advantage of an apparent bounty by the farmer !

Nature Month by Month—September

There is a keenness in the air, these September mornings, and a diminution in active wild life that presages autumn. There is a settled quiet ; a seeming awareness of the passing of summer and a sense of waiting for the colder days to come.

Foliage is looking dingy, now, and here and there leaves are already browning at the edges. Wild flowers are fewer and the best are over, but in the gardens the mauve of the Michaelmas daisies is coming into prominence.

For most wild birds nesting-time has long passed, but even now a few pairs of wood-pigeons will be rearing their third or fourth brood The robins are singing their winter song, and the outward movement of the migrants is noticeable. Already the swifts have gone, and soon the swallows will be congregating on the telegraph wires and the railings near the farmhouse. There have been fewer swallows this season than I have seen for many years, although the house-martins seem to be well up to strength. Partridges are on the stubbles ; for the most part they avoid the root fields on the wet days.

The great red-underwing moths are out. At rest in the daytime, with folded wings, they are mere triangles of mottled grey on the willow trunks, so like the bark that they are very hard to find, but on walls and fences quite easy. On a railway bridge the other day I saw five of them in an area of not more than six feet by four. In the orchard there is a small heap of abandoned, rotting apples—a great attraction to the red admirals. In the garden there is a buddleia still in flower. If one but touches a branch of the shrub on a sunny morning there arises a cloud of butterflies—red admirals, peacocks, whites and others. Not for the first time I have noticed how the lure of the mauve blossom-cones of this buddleia is so much stronger than that of the orange globes of the other kind.

On the Moor the bracken is turning, although not yet will it assume that uniform rust-red that will be so marked in late autumn and early winter.

Our sandpipers have gone, and some of the curlews are visiting again their feeding haunts on farmland. Not for some time yet will the woodcock be in, nor the companies of golden plover.

The river, again, is low and sluggish, and most of the trout are keeping to the stickles and the rougher pool-tails. There is much weed in the quiet reaches.

Soon we shall have the first frost of autumn to mark more plainly the changing season. Meanwhile, to the outdoor man, September remains one of the best of all months in the South-West.

F.H.L.

Exmoor: Economic Survey The Exmoor hill district is a small isolated upland area sharply divided from the fertile vales of Williton and Taunton to the East and South, and clearly distinguished from the less hilly North Devon country which borders it on the South and West. The altitude is not extreme: very little of the area exceeds 1,500 feet, and the contour here used as a survey area boundary is 800 feet. In this part of England the mere temperature at such heights is not severe. The climatic difficulty is mainly humidity in the form of rain and mist, and this factor combines with stony soils from which lime is readily leached, and steep intersecting combes presenting obstacles to transport, to produce a distinct agricultural and social problem, which is the more obvious and clearly recognized because of the much more propitious conditions which are found so close at hand. Storm clouds over Exmoor are often visible for miles in several directions, and farmers in the vale are near enough to be well aware that hay is cut weeks later on the hill.

The idea of an economic survey of the farm land of Exmoor and the Brendon Hills arose out of a discussion between half a dozen members and officials of the National Farmers' Union and members of the Agricultural Economics Department of Bristol University, and the report*, built up from data supplied by 274 farm questionnaires, by the Department of Economics, Bristol University, will be read with interest by all concerned with the marginal farming areas of this country.

It is emphasized that this report does not pretend to supply an answer to the problem of the best use of the area under survey. Broad questions of policy which would have to be considered are quite beyond its scope, and even as an investigation of local conditions there are some relevant aspects upon which it touches slightly or not at all. The aim has been to make a factual contribution, presenting as fully as possible the financial information which is not to be had except through a confidential investigation by an independent body, and adding, to place this in its setting, some of the bare bones of a more general description of the situation. The interpretation is left to the reader.

The Marketing of Home-Produced Apples in England and Wales *Factors in the Marketing of Home-Produced Apples in England and Wales* (Economics Series No. 50) is the title of a new report issued by the Marketing Division of the Ministry. The report, which covers dessert, cooking, and cider apples, deals among other things with the imports and exports of apples and apple products, the utilization of home supplies, and marketing arrangements. The demand for and prices of market apples are also considered. The publication is available from H.M. Stationery Office, price 1s. 3d. (1s. 5d. by post).

*VERNON BAKER. *Exmoor: an Economic Survey*. University of Bristol. 5s.

COMMONWEALTH AGRICULTURAL BUREAUX PUBLICATIONS

The following is a list of journals and other periodical publications of the Commonwealth Agricultural Bureaux, with subscription rates. For journals marked with an asterisk a 20 per cent deduction is allowed to subscribers in the British Commonwealth who send their subscriptions direct.

Bulletin of Entomological Research	40s.	Nutrition Abstracts and Reviews	63s.
Review of Applied Entomology (Series A)	40s.	*Dairy Science Abstracts	35s.
Review of Applied Entomology (Series B)	20s.	*Forestry Abstracts	45s.
*Review of Applied Mycology ..	40s.	Forest Products and Utilization	15s.
Helminthological Abstracts ..	35s.	*Horticultural Abstracts	35s.
*Animal Breeding Abstracts ..	35s.	*Field Crop Abstracts	35s.
Veterinary Bulletin	40s.	*Herbage Abstracts	35s.
Index Veterinarius	100s.	*Plant Breeding Abstracts ..	35s.
		*Soils and Fertilizers	35s.

A few notes on recent miscellaneous publications are given below.

Phenothiazine 1942-46: *A Review and Bibliography.* (November, 1947) 4s.

A continuation by Edwards of the review by Davey and Innes (1942), together with a bibliography by the Commonwealth Bureau of Agricultural Parasitology in continuation of that published in 1942.

Pregnancy Diagnosis Tests: A Review. (September, 1948) 15s.

A survey of all important papers on the diagnosis of pregnancy in women and domestic animals, with the exception of those concerned with clinical methods in women.

Growth Substances and their Practical Importance in Horticulture. (1949) 12s. 6d.

A review of the actual and potential uses of synthetic growth substances in horticulture and the technical problems involved in their use.

Five Hundred Varieties of Herbage and Fodder Plants. (1948) 15s.

A compilation of information on crop varieties collected from many parts of the world, indicating the desirability of some attempt being made by research workers to achieve uniformity in regard to standards, nomenclature, synonyms, etc.

New and Promising Varieties Recently Described in the Literature (*7th* issue). (May, 1948) 2s. 6d.

The Practice of Soil Conservation in the British Colonial Empire. (1948) 10s.

This is the first detailed account of colonial soil conservation to be printed. The main conservation methods are classified and their effectiveness in different territories discussed. The control of grazing and livestock management and systems of colonial agriculture in relation to soil conservation are described. There are chapters on the use of machinery and aerial-photographic surveys, and an account of colonial legislation relating to soil conservation.

All correspondence concerning the above publications should be addressed to the Commonwealth Agricultural Bureaux, Central Sales Branch, Penglais, Aberystwyth, Wales.

THE MINISTRY'S PUBLICATIONS

Since the date of the list published in the June, 1949, number of AGRICULTURE *(p. 136), the undermentioned publications have been issued.*

Bulletins Copies are obtainable at the prices mentioned from the Sales Offices of H.M. Stationery Office or through any bookseller.

No. 113 Rhubarb (*Revised*) 1s. 0d. (1s. 2d. by post)

Technical Bulletin No. 1 : Specifications and Methods of Analysis for Certain Insecticides and Fungicides (*New*) 1s. 3d. (1s. 5d. by post).

Advisory and Animal Health Leaflets Single copies of not more than 16 leaflets (four in any one group) may be obtained, free of charge, on application to the Ministry, 1-3 St. Andrew's Place, Regent's Park, London, N.W.1. Copies beyond this limit must be purchased from the Sales Offices of H.M. Stationery Office, net price 1d. each (2d. by post), or 9d. per doz. (11d. by post).

Group I. Livestock and Dairying

No. 113 Rearing Fowls for Egg Production (*Re-issued*)
No. 341 Artificial Incubation (*New*)
No. 342 Housing Systems for Flocks on the Range (*New*)

Group II. Pests and Diseases of Farm and Horticultural Crops

(a) INSECTS PESTS
No. 183 Narcissus Flies (*Revised*)
No. 339 Chrysanthemum Eelworm (*New*)

Group IV. Birds

No. 237 The Carrion Crow (*Revised*)

Group V. Weeds

No. 190 Bracken Eradication (*Revised*)

Group VI. Other Publications

No. 236 Commercial Horticulture : Advice to Beginners (*Revised*)
No. 297 Sweet Corn (*Revised*)
No. 311 Sunflowers as a Seed Crop (*Revised*)
No. 343 Commercial Varieties of Apples and Pears (*Revised*)
No. 344 Migratory Beekeeping (*New*)

Animal Health Leaflets

No. 22 Worms in Poultry (*Revised*—superseding Advisory Leaflet No. 317)
No. 27 Swine Erysipelas (*Revised*—superseding Advisory Leaflet No. 17)
No. 30 Anthrax (*Revised*—superseding Advisory Leaflet No. 74)

Marketing Leaflets

No. 104 Recommended Grades for Pears (*New*) 2d. (3d. by post)

Other Publications

Smallholdings : First Report of the Smallholdings Advisory Council (*New*) 1s. 3d. (1s. 5d. by post)

Agriculture Overseas : Report No. 9—Green Crop Conservation in Germany (*New*) 1s. 0d. (1s. 2d. by post)

N.A.A.S. Quarterly Review No. 4 (*New*) 1s. 0d. (1s. 2d. by post). Annual subscription 4s. 6d. (including postage)

BOOK REVIEWS

Green Crop Dryers' Research Association Year Book, 1949. The Farmers Weekly. 10s. 6d.

Artificial drying is inherently the best—and indeed the near-perfect—method of conserving green forage ; but many difficulties have been encountered in the practical application of the process, and it would be wrong to suggest that all of these have been surmounted. Rapid progress is, however, now being made, and there is everything to be said for the publication of annual progress reports. This volume is the first of a projected series.

The book contains articles by recognized authorities on every aspect of the subject, excepting only its economics. Dr. Slade, in his introduction, apologises for the gap, explains that no sufficient body of cost data was available in time for the present issue, and promises that the want will be supplied in the next. There are informative advertisements of practically all the items of equipment that are at present available.

It is impossible to notice separately all of the twenty-five articles that the book includes. Some of these, like those by Dr. Holmes on the proteins and vitamins of grass, and by Mr. A. C. Hutt on fuels, are admirably clear explanations of basic scientific facts and principles. Others, by Prof. Stephen Watson, by Mr. Leonard Robinson and by Drs. Woodman and Evans deal with the use of dried grass in the nutrition of the different classes of livestock. Still others, by Mr. Gordon Saunders, Mr. William Alexander and Mr. T. S. Bennett, tell of personal and practical experiences. The exceptionally troublesome problem of drying sugar-beet tops is discussed shortly by Mr. Frank Rayns, and at length, on the basis of German experiences, by Dr. Kurt Seidel—the dilemma being that the fresh tops have an expensively high water ratio while the wilted material is often so heavily contaminated with soil as to give a dried product that is unsafe.

Dr. William Davies writes on the production of grass for drying, and Mr. J. L. Davies analyses the Milk Board's experience in the organization of communal drying.

A long article by Mr. Møller Nielson (incidentally not very well translated) shows that Denmark has encountered the same difficulties as ourselves in growing lucerne, and points to much the same precautions, aimed at reducing the risks of failure, that our own authorities recommend.

Mr. J. C. Lynn and Dr. A. B. Fowler speculate about the future ; the former, looking at the process with a business man's caution, should be read closely by the optimists ; the latter stresses the special difficulties in the co-operative organization of drying plants.

The Association is to be congratulated on producing a book that will be of great value to all who have a mind to set up in crop drying.

J.A.S.W.

The Potato. W. G. BURTON. Chapman and Hall. 25s.

The avowed aim of this book is an attempt to summarize our knowledge of the potato vegetable as a source of food, more particularly from the viewpoint of a plant physiologist. And it is a very good attempt. The author seldom draws his own conclusions, perhaps wisely so, for much of the evidence cited is at times conflicting.

Much reading has gone into its preparation, as evidenced by the many references appended to each chapter. That indeed there are so many will surprise those unaware of the large amount of experimental work, mainly American, already done on the potato. They also show the need for properly co-ordinated work in this country. Most of the English references are to the few books published in this country on the potato, and to the experiments of the Rothamsted Experimental Station and of the National Institute of Agricultural Botany.

No attempt is made to deal with the cultivation of the crop, but the keen practical grower will find much of interest in the three hundred odd pages of the book, particularly in the chapter on the factors influencing yield, and on storage.

The student and young research worker will find this book most useful.

J.C.W.

Fuel and the Future. H.M. Stationery Office. 6s.

In agriculture large quantities of fuel are used in moving heavy or bulky materials and in raising temperatures to provide favourable conditions for plant growth or to destroy harmful organisms. *Fuel and the Future* is the report of a conference convened in 1946 by the Ministry of Fuel and Power, and in the section dealing with agriculture and horticulture the need for greater efficiency in use of fuel is stressed both by implication and by direct statement.

Nearly 1½ million tons of solid fuel are used each year on the land, over one-half in heating glasshouses, but of greater importance is that this amount is used by a large number of relatively small-scale consumers, not all of whom are aware of the need for raising their standard of efficiency in fuel utilization.

This publication is well worthy of the attention of farmers and growers, for it not only indicates the need for greater efficiency and the direction in which that efficiency lies but also shows how it can be achieved. At the present time national advantage must have first place, but in fuel economy national considerations run hand in hand with the advantage to the individual consumer.

L.G.B.

The Production and Marketing of Pigs. H. R. DAVIDSON. Longmans, Green. 30s.

Now that the redevelopment of our pig husbandry back to or beyond its pre-war level is well under way, and perforce under conditions which differ widely from those prevalent before the war, it is clearly desirable that farmers, livestock advisers and agricultural students should have available for convenient reference the long-needed authoritative review of the present state of knowledge in the field of pig husbandry. All concerned are thus under a great debt of gratitude to Mr. Davidson for having undertaken, and successfully carried through, this formidable task. No specialist in pig husbandry could be better equipped, for he possesses the valuable combination of successful experience as teacher, research worker and practical pig breeder.

Throughout, what he stresses most, and rightly, is the necessity for regarding the results of pig management as the expression of a complex equilibrium conditioned by the simultaneous interaction of a large number of factors. Only thus can one avoid the distortion of interpretation that is so apt to arise from exclusive study of the effects of a single factor or group of factors, genetic, nutritional, environmental or otherwise.

The book has three main divisions. In Parts I and II, which take up about two-thirds of the volume, the author outlines the general principles involved in the sciences cognate to animal husbandry, with a shrewd analysis of the possibilities and limitations of their application in practice. The field covered by these sections is extremely wide, but particular mention should be made of Mr. Davidson's treatment of the problems of breeding and pig meat, to the elucidation of which his own work has made so great a contribution.

The level of treatment aimed at (especially in Part II) is that required for the institutional student at " pass degree " or " diploma " level, and the select minority of " study-minded " farmers. For the benefit of the " practical producer without scientific training," the essence of Mr. Davidson's philosophy and experience is distilled into Part III (Practical Aspects of Management), which for this class of reader is almost a text-book in itself.

This book fills a longstanding gap and is likely for many years to remain the standard British contribution to our reference literature on pig husbandry. It will make its strongest appeal to the classes of readers indicated above ; for the " average farmer " much of Part II will be difficult reading. Mr. Davidson can now confer a great boon if he will prepare a " farmers' digest " of his *magnum opus* for the pigman, who constitutes perhaps the most potent of the many factors that determine success in pig production.

C.C.

Journal of the British Grassland Society. Vol. 4, No. 2 (June, 1949).

The variety of grassland types, even in a small country such as Britain, produces problems particular to individual grassland and soil types. However, the combination of edaphic, climatic and environmental conditions is repeated in widely separated areas. A description by Laird of the grassland farming of the West of Scotland shows its resemblance to that of other areas within the country. It becomes increasingly clear, as a result of the expanded tillage acreage, that the sown sward is more and more relied upon to improve soil structure and control weeds, in addition to its primary function of providing herbage. With ensilage and artificial drying, the grass crop is entering the category of a concentrated food.

Wyllie Fenton has contributed a paper on " Vegetation Changes in Hill Grazings with Particular Reference to Heather". The heather moor forms one of the most distinctive and valuable grazing associations on hill land. The management of the heather moor, largely by burning, is outlined, but it would appear that the operation is by no means simple and that it needs careful adjustment to the age and condition of the growth if vigorous heather is to be maintained ; further experiments and research are required.

Raymond *et al.* report on the progress made in the use of cold storage at *c.* 0° F. to increase accuracy in determining the digestibility of fresh herbage.

A contribution by Champness deals with the variability encountered in sampling fields for the determination of viable seed in the soil.

Some new research projects undertaken in overseas countries are described briefly in notes contributed by the Commonwealth Bureau of Pasture and Field Crops. These include land use and rotation experiments being conducted in South Africa, aerial distribution of seed and fertilizers in New Zealand, and recent trends in Soviet Grassland Research.

Semple, in a paper entitled " Some Grass Species of Ethiopia," gives an account of some typical grass associations and species encountered while the author was in that country as an officer of F.A.O.

T.E.W.

Mammals in Britain. MICHAEL BLACKMORE. Collins. 15s.

For an attractively presented and clearly expressed introduction to the study of British mammals, Mr. Blackmore's book may be highly recommended. It fulfils what I imagine is the author's purpose in whetting the appetite for more; and for that reason I wish he had included a selected bibliography for further reading.

Compared with our bird life, the number of British mammals is few; yet, for all that, they have attracted less field study. In these circumstances, therefore, it is not unnatural that superstition, as absurd as it is unjust, has grown up around them, and in some parts of the country has hardened into a prejudice which it is difficult to eradicate.

This book is particularly welcome, therefore, in setting out quite simply the facts of the life histories and habits of such common British mammals as the moles, shrews, hedgehogs, rabbits, hares, rodents, foxes, badgers, otters, deer, and bats. The chapter on bats is, indeed, quite the best in the book.

As Mr. Blackmore points out, the bat is not the half-bird, half-mouse creature popularly suggested by the name of "flittermouse" attached to it in some rural areas. It is a true mammal of some fifty to sixty million years' ancestry, and the only one capable of real flight, living entirely upon insect life. Bats are wholly beneficial to man and should not therefore be molested.

Not so, for example, the vole, when its numbers increase unduly. Mr. Blackmore records that in the vole plague years of 1891–93 in southern Scotland, thousands of acres of grass "were eaten down to the roots, so that the land became quite bare and lambs actually died of starvation". Fortunately, however, such occurrences are rare.

The value of the text is enhanced by many first-class half-tone reproductions, which reflect the infinity of patience required by the naturalist photographer who is determined to get his picture.

S.R.O'H.

Birds in Britain. FRANCES PITT. Macmillan. 25s.

The best reason for writing a book is that you wanted to write it, and this is the reason Frances Pitt has given for adding yet another to the legion of bird books. She has given another reason too—that she felt there was still room for something between Coward's book for beginners in ornithology and Witherby's *Practical Handbook* for experts.

Birds in Britain (which is in the same fine series as *Flowers in Britain*, *Trees in Britain* and *Dogs in Britain*) offers a survey of bird life (domestic as well as wild, but primarily wild) in Britain. Introductory sections deal with the bird's place in the natural economy, the physical structure of birds (with special emphasis on the functional aspect of that specialized structure), the migration problem, and general questions of bird behaviour. On the last two subjects the author has managed to steer a refreshingly sane middle course between the extremes of cold science and emotional anthropomorphism.

The main body of the book is devoted to detailed descriptions of the birds: their plumage and general appearance, habits, breeding characteristics, and so on. It would be presumptuous of me to remark that Frances Pitt knows what she is talking about—her name has been a household word since before the days when I was first meeting the robin in a picture book at my father's knee—but I may perhaps add that there is not one page among the six-hundred in this fine book where the author's inimitable personal touch does not enrich with personal experience and observation the facts which she presents so adequately.

Winifred Austen has designed a lovely pictorial jacket of goldfinches on cornflowers and there are sixteen admirable coloured plates by Roland Green. For the rest, illustration is by photographs, and their complete adequacy confirms a growing conviction of mine that colour is a secondary aid to identification; poise, stance, manner—what the wildfowler generically calls "jizz"—these are what give each bird its unmistakable label, and they are caught more often and more infallibly by the camera than by the most careful draughtsman-artist.

It is a rich book in every sense of the word, recommended alike to the beginner who wants to begin correctly yet needs a little human help, and to the expert who appreciates an element of personal observation added to his facts. But most of all, perhaps, a book for the "half-and-halfer" (like myself) who knows a hawk from a hand-saw but still has a long way to go.

E.M.B.

Geology and Scenery in England and Wales. TRUEMAN, A. E. Pelican Books. 2s. 6d.

When the farmer and the agricultural adviser lift their eyes from the crops and the luscious leys of England and Wales, they see that scenery which has made this country famous and the object of nostalgia of many an exiled Briton in less favoured environments. " Its mountains are not high, nor its rivers long, but within a few hundred miles of travel from East to West an Englishman may see more varieties of scenery than are to be found in many bigger countries." It is in order to help one to appreciate the background of landscape that Professor Trueman has produced this most readable book on what might at first glance appear to be a somewhat dry subject.

This Pelican is a reprint with only minor modifications of an edition which appeared in 1937.

The relationship is traced between the geological structure and rock types, and the landscape features such as forms of hills and the course and nature of valleys, and so on to the types of villages which have been built of local stone, and which have thus become such characteristic features of the various regions of the country.

Starting with the Cotswold Stone Belt and its northern extension into Northamptonshire, Leicestershire, Lincolnshire and Yorkshire, Professor Trueman then turns to the chalk areas of England, " which Huxley thought so suggestive of mutton and pleasantness, . . . wide expanses of grassy downland and the smooth rounded curves of the hills. . . . On these rolling hills clumps of beech crown many summits, but great areas are given up to sheep pastures, and there are wide stretches of open tillage. Farms are few, and often are so placed in the valleys that in a view over miles of country scarcely any are in sight."

The theme is continued in an equally interesting way through the heart of England, the London basin, the Weald of Kent and Sussex, the South coast, East Anglia, the Fenlands, mountain limestone, Pennine moorlands, the Lake District, and so into Wales, which is divided into North, Central, South, and the Borderland. The book ends in the South-west, in the Bristol district and the Somerset Plain, Exmoor and the North Devon coast, South Devon and Cornwall.

This book will certainly heighten the interest and appreciation in that " scenery " which the average Briton tends to take rather for granted, and should certainly become a *vade mecum* for the overseas visitor whose interests and wanderings lead him into the English and Welsh countryside.

R.O.W.

William Cobbett. W. BARING PEMBERTON. Penguin Books. 1s. 6d.

It is more than a century since William Cobbett died, yet few men of his time (a great and memorable period in English history) are so frequently quoted as he. What was there about Cobbett that has marked him off as one of our greatest Englishmen ? In a sense he was a failure, notwithstanding his many achievements ; he was given to faulty judgment and in many ways he was remarkably contentious and intolerant. But he bore no malice; he was fair-minded, a clean fighter and intensely human ; above all, he was never vulgar. He farmed but he was not a great farmer, despite his keen interest in experiments ; he wrote but he was not a great writer, although his *Rural Rides* has become, and will remain, a classic of our literature. The real answer, probably, is that Cobbett makes us *feel* the England of his day and thereby he belongs to that small but very select company wherein are found Pepys, Evelyn, Bunyan, Borrow, Latimer, Walton, White, and Fielding.

Cobbett's seventy-two years of active life, into which he crowded so many interests, present a fertile field for the biographer. In such a field the politician, the economist, the philosopher, and even the wit have alike delved profitably, though perhaps somewhat partially. It was inevitable, however, that this vivid and picturesque figure of English social history would some day come under a biographical examination by a competent historian. Thus it is gratifying to welcome a new and specially written Cobbett life to the list of Penquin biographies. Few more competent to accept the task of writing such a book than Mr. Pemberton could have been found. He has given us an intensely interesting and critical account of Cobbett's whole life in which no words are wasted and yet nothing of importance is omitted. The author rightly emphasizes that Cobbett's greatness belongs to the last fifteen years of his life. In 1820 he was fifty-eight, his fortunes were at a low ebb (he was in debt and had lost the Botley property), but finding himself free from the day-to-day cares of his farming interests, and having settled at Kensington, he was free to plan his rides east, west, north and south to explore the countryside he loved so well. We see him as Mary Mitford described him : " . . . a tall, stout man ; fair and sunburnt, with a bright smile, and an air compounded of the soldier and farmer, to which his habit of wearing a red waistcoat contributed not a

little". We have a mental picture of him, all through those eight years after 1821, carrying out that painstaking examination of rural England, surveying the soils, criticizing the crops and noting the condition of the people, no mean task for a man past sixty years of age. And in writing of his experiences he found just the right language, so that *Rural Rides* stands out clearly, by itself, as a piece of descriptive writing about rural life which placed Cobbett immortally beside Cato.

Mr. Pemberton skilfully examines this closing period of Cobbett's life, which included a few years as member of Parliament for Oldham. And although it is more than a century since this remarkable Englishman " leant quietly back in his chair, as if to sleep, and was at peace with the world," his voice speaks to us of this generation, bringing a message.

In the minds of Englishmen the name of Cobbett stands as a symbol of unswerving purpose and constancy of character. Constancy was the golden thread running through all the years of his life, and in the words of Coriolanus, he could have proclaimed : " while I remain above the ground you shall hear from me still ; and never of me ought but what is like me formerly".

A.H.H.

Britain Can Breed It. FARMER AND STOCK-BREEDER. 12s. 6d.

Farmers and stockbreeders are notoriously prone to hide their light under a bushel, but the days when a good article needed no advertising have gone—even if they ever existed.

Mankind the world over has benefited from the results of the skill of British stock-breeders, and immense businesses have been set up to deal with the products of meat, bones, hides, milk, and wool. So satisfactory were the animals which were exported that buyers of British stock returned again and again to obtain replenishment for their herds and flocks. This demand is still far from being satisfied, although there are now other competitors in the livestock field who in turn have also largely built their foundations on stock of British origin.

The book deals with British breeds of horses, cattle, sheep and pigs, giving a short history of their origin, qualities, capabilities and uses. In addition the illustrations speak for themselves and clearly show the excellence which British livestock has attained.

The publication will be most helpful to foreign buyers when selecting the breed or type required, and it should do much to assist in earning the dollars which Britain needs so badly. It is also of no less interest to British stockbreeders, who can see breeds which are seldom seen together except at national shows. The publication is, in fact, a national show in itself, with the added advantage of information on use.

Both authors and publishers are to be congratulated on producing a publication which, with its excellent illustrations, will be of great value to foreign and British breeders.

H.T.

Landmarks. A. G. STREET. (Illus. by Denys Watkins-Pitchford). Eyre and Spottiswoode. 12s. 6d.

Mr. Street has reached the age when he feels that he can look back over his shoulder without apology. The result is *Landmarks*, a pleasing collection of reminiscences of Wiltshire rural life. Much of the old familiar scene is changed : the dwindling number of hayricks against the downland skyline as more and more hay is baled into neat oblong packs ; fewer lines of stooked corn set in aisles upon short stubble as the combine harvester ousts reaper and binder ; the mechanic's bench and the smell of oil where once there was harness and the scent of saddle soap and leather ; the old willow, the friend of generations of children, lovers and old men, a casualty to planning. These and many other landmarks, the remembered things of youth, emphasize the passing of the years and the coming of new ways, new ideas. That is not to say, however, that Mr. Street's writing is a lament for the old order, for where progress in farming is concerned we shall always expect to find him to the fore. But there is in every man a streak of inconsistency which, whilst admitting the inevitability, and often the desirability, of change, yet acknowledges the loss of an old " landmark " with a sigh.

For the most part Mr. Street the farmer is off duty in this book. With all the self-conscious pleasure of a schoolboy playing truant, he hunts, fishes and shoots ; he attends the village flower show, the cricket match, the local gymkhana ; he approves the blue smoke of a hedger's fire spiralling to a winter sky, a line of cool limes beside the lake, a pattern of cloud riding the downland fields. Though some landmarks are lost, others, such as those which Thomas Hardy had in mind, " will go onwards the same, though dynasties pass".

S.R.O'H.

BOOKS RECEIVED

The Grazing Animal. J. F. H. THOMAS. Faber. 15s.

Marketing Poultry Products. (4th Edition). EARL W. BENJAMIN, HOWARD C. PIERCE and W. D. TERMOHLEN. Chapman and Hall. 36s.

Introduction to Agricultural Economics. EDGAR THOMAS. Thomas Nelson. 10s. 6d.

Cation Exchange in Soils. W. P. KELLEY. Chapman and Hall. 27s.

The Plums of England. H. V. TAYLOR. Crosby Lockwood. 30s.

A Full Life in the Country. KEITH JEREMIAH. Batsford. 12s. 6d.

Life in an English Village. Sixteen Lithographs by Edward Bawden with an Introductory Essay by Noel Carrington. Penguin. 1s. 6d.

British Herbs. FLORENCE RANSON. Penguin. 1s. 6d.

The Flower and the Wheel. ADRIAN BELL. Bodley Head. 7s. 6d.

The Food Manufacturing Industry in Germany during the period 1939-1945. (British Intelligence Objectives Sub-Committee Overall Report, No. 14). H.M.S.O. 2s. 6d.

The Potentialities of Wind Power for Electricity Generation (with special reference to Small-Scale Operation). E. W. GOLDING and A. H. STODHART. The British Electrical and Allied Industries Research Association (Technical Report Reference W/T 16). 1s. 6d.

Machinery on the Farm. THOMAS HUTCHISON. Blackie. 17s. 6d.

Woodland Crafts in Britain. H. L. EDLIN. Batsford. 15s.

Soil Fertility and Sewage. J. P. J. VAN VUREN. Faber. 18s.

The English Rural Labourer. G. E. FUSSELL. Batchworth. 12s. 6d.

Catalogue of Books on Agriculture, Horticulture, Animal Husbandry and Veterinary Science (1949). H. K. Lewis.

Printed in Great Britain under the authority of HIS MAJESTY'S STATIONERY OFFICE by C. Nicholls & Company Ltd., The Philips Park Press, Manchester, London and Reading